THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIV. No. 1384.] LONDON, NOVEMBER 19, 1889. [41ST YEAR. Price 6d.

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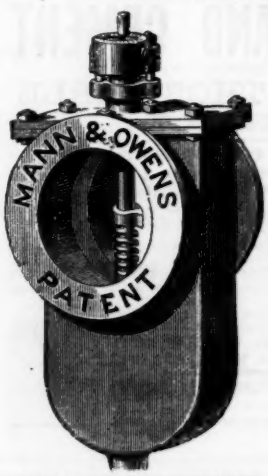

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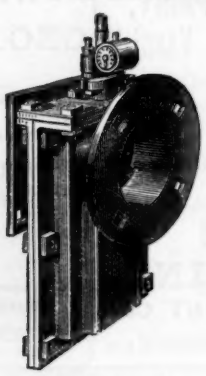

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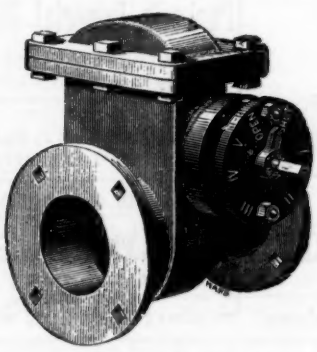

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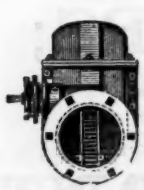

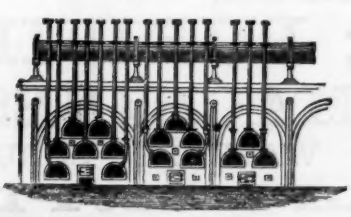

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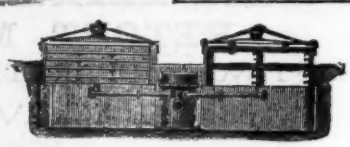

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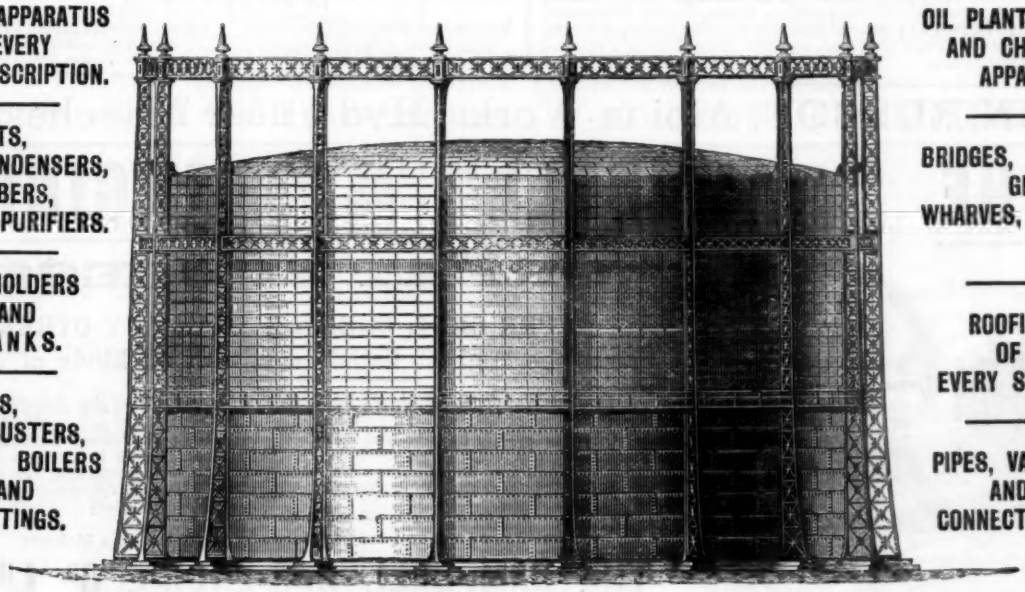

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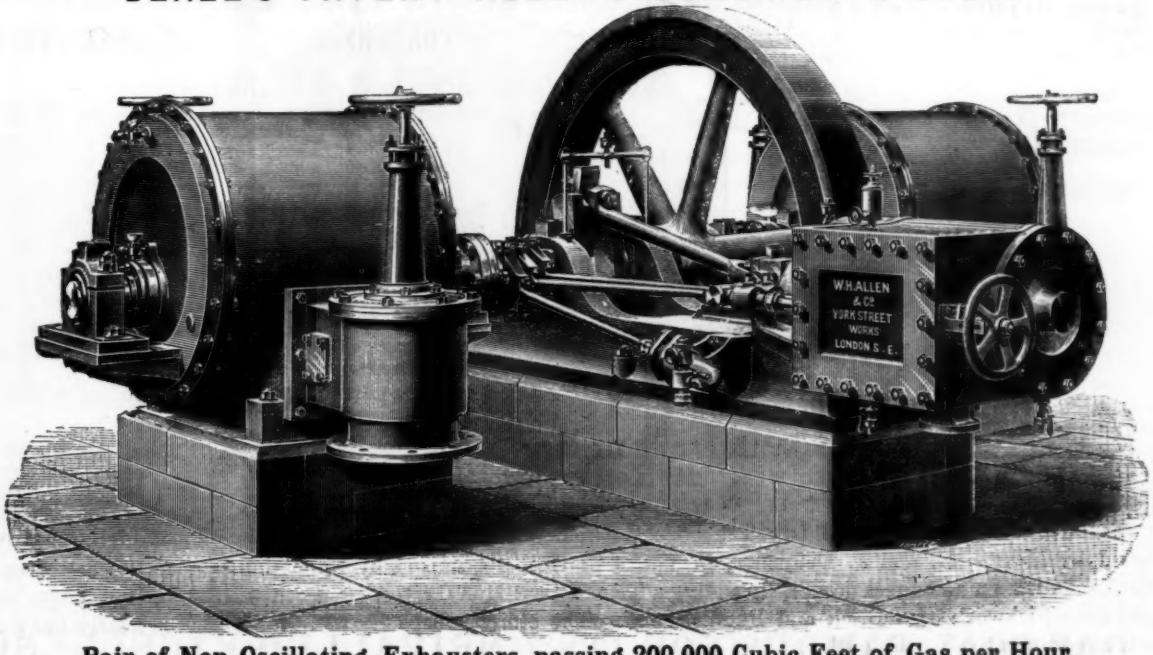

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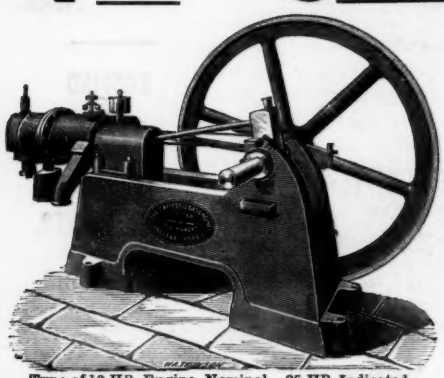

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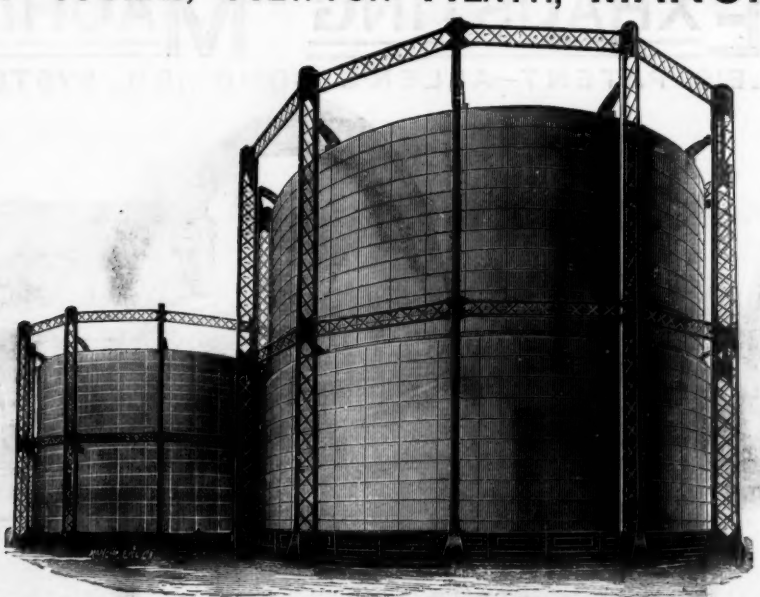

Illustration showing view of two Telescope Gasholders, each 65 feet diameter by 48 feet high, recently erected by Messrs. R. and J. Dempster, in Tanks previously occupied by Single-lift Holders 20 feet deep. The Tanks were made 4 feet deeper, by adding a Tier of Cast-Iron Plates, prepared with suitable Flanges, to meet the Brickwork of a Brick and Puddle Tank. The storeage capacity was thus increased nearly 150 per cent. at comparatively little outlay.

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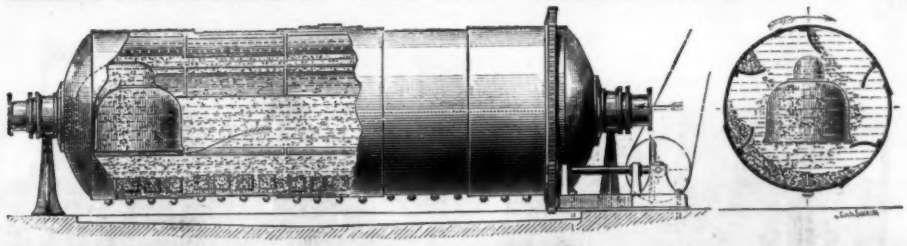
By Agitation with Metallic Iron.



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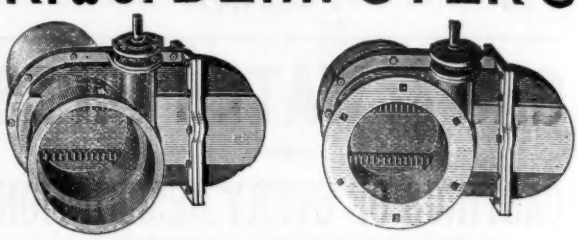

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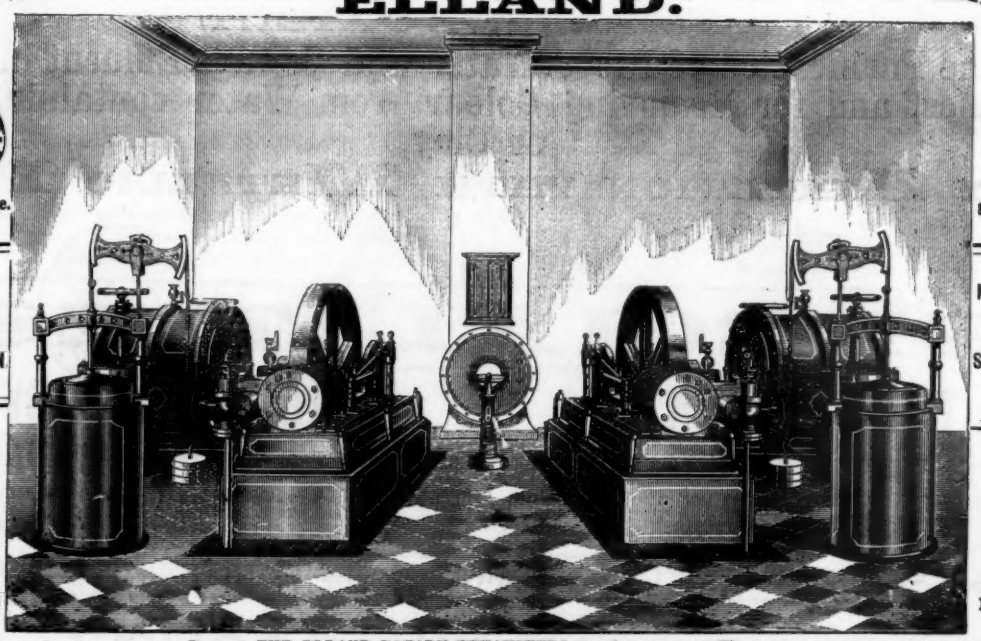

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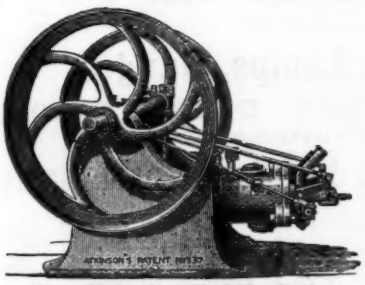

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THE BEST ENGINE FOR ELECTRIC LIGHT.

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THE ABOVE SETTINGS & FURNACES ARE PROVING EMINENTLY SATISFACTORY.

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AND SPECIALTIES OF EVERY DESCRIPTION.

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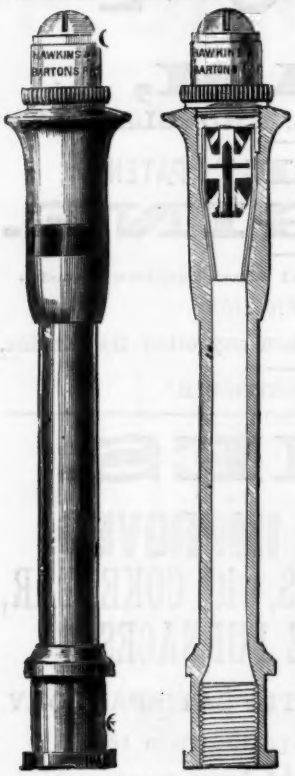

Full Size, No. 1098.

These Governors are made to take to pieces for cleaning and re-adjusting.

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An enormous quantity of these Burners are in use in this Country and abroad; and they have never failed to give satisfaction. Wherever they are adopted, complaints against Bad Gas and Excessive Gas Bills naturally cease. Owing to their extreme simplicity, they cost less than half that of any others, and will last years without attention.

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REPORTS

By T. Newbigging, Esq., C.E
Feb. 25, 1889.

Burner tested, 4 feet.
Pressure, 10, 15, 20, 25 tenths.
Consumption, 4, 4, 3·95, 3·8 feet.

By G. Bower, Esq., C.E.,
St. Neots, *March* 12, 1889.

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By J. Mackay, Esq., Engineer, Gas-Works, Peterhead,
July 18, 1889.

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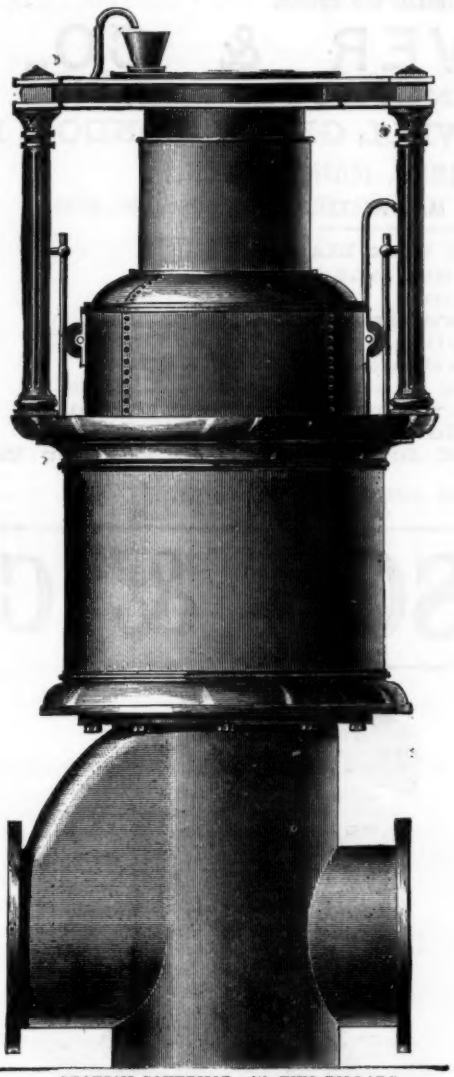
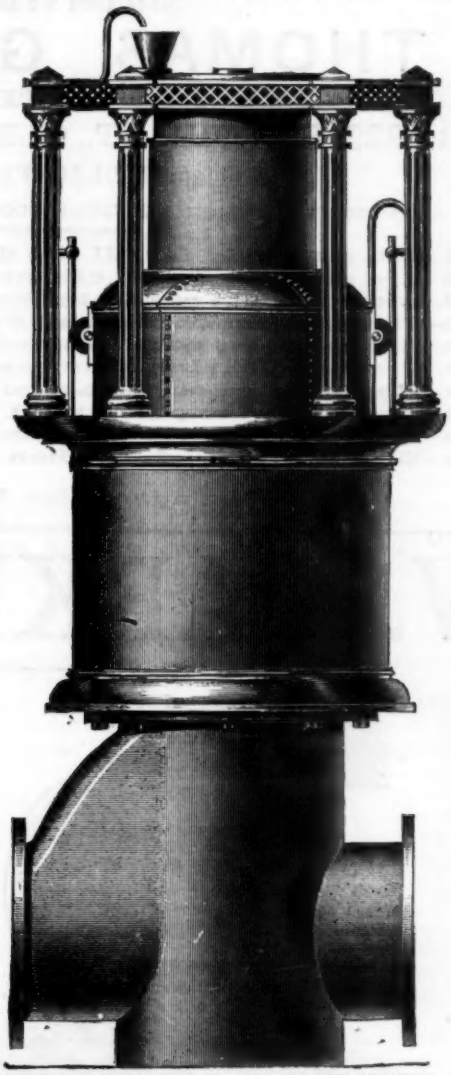


STATION GOVERNOR with TWO PILLARS.



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[See also Advt., p. 992.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 19, 1889.

THE SOUTH METROPOLITAN EXPERIMENT.

THE profit-sharing experiment of the South Metropolitan Gas Company has been mentioned during the past week in several London newspapers; but in none has it been examined or discussed with the attentive study which its importance demands. It has, in fact, been treated exclusively as a feature in the development of the labour question which is at the present moment agitating the industrial and commercial community; and for this reason the permanent character of the project has escaped notice. It could have been wished, of course, that the experiment had been started amid other circumstances; but it is impossible to ignore the truth that all reforms take their rise in agitated times. When everything is quiet, it is extremely difficult—to the verge of impossibility—for any reformer to arouse sufficient interest in his schemes in the minds of others who have not addressed themselves so closely as he has done to the study of the evils which he seeks to remove. The idea which has now been carried out is not a new fancy with Mr. George Livesey. He has cherished it quietly for years, until at last he has found a Board of Directors willing to agree with him. Twelve months—six months ago, we do not believe he could have done it, so largely is the will of individuals subservient to the force of circumstances. We remarked last week, when announcing the new experiment, that we should not then discuss it. Neither shall we do so now; preferring to let it work itself out a little more completely than time has yet permitted. Upwards of 900 men, as we learn, have signified their desire to participate in the scheme; and the number is likely to increase. As to this, however, we shall say very little, lest any expression we might use should be misunderstood. Workmen are not children, to be told what they should do in their own interests. They will act shrewdly enough if they think for themselves, and escape for a time from that gregarious habit which has been preached to them as the highest wisdom. Although it is decidedly premature for a full discussion of the scheme, however, it is far too serious a matter to pass over for a week without any mention at all; and so we shall devote a little attention to the press notices, such as they are, which it has so far received.

In the majority of newspapers, the scheme was simply published with or without a line or two of introduction. When any expression of opinion occurs in these, it is only as a single adjective—always, so far as we can trace, expressive of approbation. The only morning newspaper that could find space, among the discussions of the utterances of hack party politicians, policies of cricket clubs, and the other all-important matters of an hour which occupy the editorial columns of these journals, for the explanation of the schemes was the *Daily Chronicle*, which introduced the subject by describing it as "a step which may inaugurate a new and "permanently satisfactory state of relations between the "Directors and their employees. . . . The engagements "are such as might reasonably be asked of the men. . . . "Possibly it may be the precursor of more sympathetic "relations between large companies and their employees; "and certainly it sets an example which, if largely followed, "should be conducive to greater harmony between capital and "labour." It was mentioned favourably, but not discussed, in *The Times*, *Daily News*, and *Telegraph*. The evening papers have a little more time for sifting the day's news; and several of them commented upon the project. The *Pall Mall Gazette* was attracted by the Socialistic savour of the idea, but shocked at the notion that the Gas Company should make indulgence in a strike, or injury to their property or business, a ground for the forfeiture of benefit under it. This limitation, they sagely thought, might wreck the whole scheme; being apparently ignorant of the extent to which it had at the time been adopted. The *St. James's Gazette* had a brief notice, in which the power of the scheme to terminate labour disputes is duly acknowledged, not as an objection. It is remarked that "once again "an experiment is to be tried which has frequently broken "down. . . . The difficulty which has hitherto proved "almost invincible is to arrange satisfactory terms with a "changing corporation like the employees of a big concern. "Only where the business is tolerably uniform, neither self-"expanding nor self-diminishing, and where the same "amount of labour is regularly employed, is it easy to main-"tain such a contract. But a contract soon falls to the "ground, being unenforceable, when one of the parties to it "is at once composite and constant only in change." There are several other notices of the scheme in the weekly papers, not one of them, however, being worth quoting, except the *Labour Elector*, which can only admit that it is a "good "dodge."

It appears, therefore, that the *St. James's Gazette* is really the most helpful critic, so far as the newspapers are concerned, although even this criticism does not amount to a

great deal. It tells us that the principle is not new, which nobody will deny. That it has frequently failed, moreover, is true enough. As we understand the matter, however, the difficulty which has proved so formidable in this movement is not so much the changeable nature of the "corporation" of employees, as the establishment of a mutually satisfactory datum on which to base the partition. The shifting nature of the body of workmen in any industrial establishment of a permanent character is easily overrated. Although the hands are only engaged from hour to hour, and are paid every week, the great majority of the steady ones remain in the same employment year after year, and generation after generation. It is the domestic servant, not the workman or workwoman by the day, who changes employment for the sake of variety. Supposing the principle to be accepted, there would be no more difficulty in apportioning the labour share of the profit of a permanent concern than there is in the practical working of the Employers' Liability Act. Indeed, a clever actuary would work out the whole thing, just as well as the German Government insurance of workmen has been settled, provided that the datum is agreed upon beforehand. The occasional removal of a workman would be dealt with by giving him his just share for the period during which he was borne on the books of the concern, after a "surrender value" which an actuary could easily propound. The whole difficulty lies in the datum. It is desirable, if not essential, that the business to be shared in this way should be uniform and regulated in accordance with a few manageable standards of profit and loss. Such, the *St. James's Gazette* omits to acknowledge, are Gas Companies. Some critics of the scheme amuse themselves by wondering what will happen if the price of gas should go up in the South Metropolitan district—of course with reference to the supposition that gas is going to be extinguished by the electric light. We need not contemplate for the present any such reversal of the current of development in gas supply as would send the South Metropolitan price up by 5d. per 1000 cubic feet, and so put an end to the profit sharing by the workmen. But even if anything of the kind should come to pass in the distant future, the workmen who take the benefit of the plan in the present will have something to the good; and if the servants of the Electric Lighting Companies, who are supposed to be capable of doing all this mischief to gas, only copy the example of the Gas Company, their workmen will have something to be thankful for.

Altogether, it is a very interesting subject, and deserves to be examined and discussed in all its bearings. Profit sharing is a notion that some people may like; while others will be certain to scorn it. At any rate, a principle that governs the relations of many hundreds of gas workmen in London to their employers is not a matter to be put aside as a mere trifle.

THE SOUTHERN DISTRICT MEETING.

The Southern District Association of Gas Managers had a particularly successful—indeed, it may be called a brilliant meeting on Thursday, which was the last under the presidency of Mr. J. Somerville, whose successor is to be Mr. T. May, jun., of Richmond. The chief item in the proceedings was the reading of a masterly paper on "Photometry," by Mr. John Methven, of Nine Elms, who is certainly one of the best of living authorities on this important subject. It was another example of the growing preference of writers of the highest class of technical papers for the small and more attentive audience of a district meeting, instead of the unwieldy crowd of a larger assembly. We are unable this week to give more than an instalment of the paper; shortness of time preventing the completion of the numerous illustrations and diagrams without which Mr. Methven's work can be but imperfectly understood. The discussion was only commenced at this meeting; the points of the paper being too numerous, and going in many instances too deeply into detail, to be properly appreciated at the first hearing. It is to be hoped that on the next occasion the discussion may be continued with more spirit than is sometimes the case with these deferred debates. Of this there is perhaps little fear, because much of Mr. Methven's matter appeals very directly to his brother Engineers of the Metropolitan district, who are, like him, under the harrow of the Gas Referees. Things are doubtless in a most unsatisfactory state in regard to the whole subject of gas testing, especially in London. Gas managers everywhere are liable to be plagued by the candle difficulty. But this trouble is multiplied indefinitely in London through the number of the tests that are made at all hours of the day or night; and there are many others added to it. The restlessness of the Referees in the matter of the design of photometers is a cause of much anxiety to the officials who are responsible for the observance of the instructions relating to the maintenance of the illuminating power of London gas. The latter never know what alteration in the pattern of the photometer will be favoured from one month to another; and, what is more to the purpose, it is impossible for them to tell what difference these alterations may make in the indications of the instruments. The troublesome part of the matter lies in the fact that apparently all the "improvements" in the form of the photometer which the Referees have patronized of late years make the registrations worse for the gas. It is difficult to credit that this result is in accordance with the spirit of the law which governs the testing of gas in the interest of the public. It is all very well for Sir W. Thomson to make photometrical observations by the aid of a lead pencil and a card, and to lament the perversity of instrument makers in complicating their apparatus intended to serve the same end. What would he say, after a year's experience as a London Gas Referee, of the remarkable influence of apparently minor modifications of the form of the instrument? The principle of the photometer is one and indivisible, consisting essentially of the comparison of two sources of light, one of which is the standard; but in the practical embodiment of this simple principle all sorts of "disturbing affects," as the philosophers call them, come into play. Perhaps these may be all resolved into the one "affect"—temperature; but even so it is necessary to be eternally on the alert to trace the conditions under which the influence may assert itself. The Gas Companies are entitled to all the benefit which they may fairly obtain from the gas as consumed with the standard burner; and they ask no more. On the other hand, they expect no less. This is really the sum and substance of Mr. Methven's argument on the appointment and duties of the Referees. As to the rest of the paper, it contains far too much detail to be paraphrased in these columns.

THE SALFORD CORPORATION *V.* ELLIS LEVER.

The apparently interminable "Salford Affair" has entered upon a fresh phase, which may be a greater surprise to some people than to others. When last we mentioned this matter, it was with reference to the agreement of the Corporation to compromise their case against certain trading firms who were alleged to have conspired with the ex-Gas Manager Hunter to defraud them, on payment of the lump sum of £10,000 into the municipal treasury. It appears, however, that the cash has not been forthcoming, either in consequence of the failure of the parallel scheme for procuring a remission of part of Hunter's punishment, or for other reasons that have not transpired. Meanwhile, negotiations have been ceaselessly pursued between the Corporation and Hunter, which, it is now reported, have resulted in the former being placed in possession of sufficient information for them to issue a writ against the "apostle of purity," Mr. Ellis Lever, for the recovery of an amount of about £2000, alleged to have been illegally paid by him to Hunter. It is further stated that some difficulty has been experienced in the service of the writ; but it has now been accepted by Mr. Lever's Solicitors. A paragraph appeared some time since in a Manchester newspaper, stating that Mr. Lever had sailed for America; and this important announcement was copied into other journals. But it is now believed that this was not a fact. Further developments of this drama will be awaited with curiosity by all who have followed its stages so far.

THE STATE OF THE PETROLEUM TRADE.

A rather remarkable circular on the state of the trade in petroleum lighting oil has just been issued by Messrs. Alfred Hopps and Sons, of Liverpool. It states that American petroleum is in a singularly strong condition, so that it really ought to be dearer on this side of the Atlantic than it is. The stock of American crude oil is reported to be rapidly diminishing, owing to the fact that the daily average consumption is far in excess of the present output of the wells. Meanwhile the consumption of petroleum all over the world is increasing enormously; the excess of American exports for the present year up to the 18th ult., as compared with those for the corresponding period of last year, being more than 20 per cent. In a very short time, we are told, the American refiners will be face to face with the fact that there is no stock above ground, and that they will have to

depend upon what the wells will yield from day to day, which is now about 23,000 barrels less than the consumption. The question consequently arises, What is to be done? The price of crude oils suitable for refining is steadily advancing, and in time the market price of the refined oil must sensibly rise, unless the American refiners take a step which will be most damaging to their trade in the long run. There is one way to make up the deficiency in the supply, and that is to mix with the Pennsylvania product a proportion of oil from the Lima field, now condemned as only fit for fuel or gas making. This is not admitted as a good merchantable oil on the New York Petroleum Exchange; being of a radically different quality from the Pennsylvanian oil. It is described as a heavy oil, somewhat like Canadian oil in odour, and likewise in the fault of dimming the chimney-glasses of lamps in which it is burnt. It is, however, inexhaustible in quantity, and also cheap; so that the temptation to blend it with the ordinary lighting oil is very great. Hints are given, in effect, that this may already be done, which would account for the numerous complaints made by consumers respecting the quality of the oil in general use. Whether this is so or not, the American refiners are warned that, if their oil does not improve, they will have to come over and sell it themselves, for the old importers will have nothing to do with it. From all this it does not appear that the petroleum trade, any more than the gas industry, is free from inward shakings from one cause and another. What the Americans are most afraid of is Russian oil, which now sells within a farthing a gallon of the best American oil, and is reported to be superior to it.

BRITISH AND FOREIGN PATENT SYSTEMS.

Some statements made in the public press respecting the revenue returned by the Patent Office have drawn out the usual complaints against the British patent system and the inevitable disparaging comparisons with the patent system of the United States. It is a curious fact that whenever this topic is discussed in the newspapers, as it is, on an average, about once in every "dead" season, the correspondents who swell the chorus of condemnation of the British patent system are all of the "disappointed inventor" type, and those who praise the American system the loudest are, as a rule, those who have had the least acquaintance with it. We are justified in saying that, in general, the American patent system is not by any means a favourite with foreign patentees; and it is notorious that many Americans regard their own system as objectionable in many respects. We do not suppose that inventors cherish any particular regard for the patent law formalities of any country, which are all troublesome in some way, and if not overtly expensive, are yet apt to be costly on account of incidental requirements which press more heavily on some patentees than on others, but generally make the foreigner suffer most severely. The American system sounds very nice as described in a newspaper letter, with its long period of protection for one initial payment. The worst of it is that the cost of the protection in the first place is apt to grow to an alarming extent in the hands of the most honourable agent; and even when obtained, it is dependent upon the duration of the shortest foreign patent for the same invention. In the States it is a matter of complaint on the part of manufacturers and patentees that they are often hindered by the existence of unworked patents anticipating portions of their inventions; and it is frequently argued that a means of killing off all useless and unworked patents after a reasonable period of probation would be a benefit to the community. This is the office fulfilled in the English system by the renewal fees after the expiration of the third year. The question of the sufficiency or excess of these fees is one of degree; but, on the whole, it does not appear that a patent which is not worth £10 after three years' complete protection is worth keeping alive. He is a wise patentee who, recognizing his failure, lets his patent lapse in the ordinary way, for in all probability it would do him no good if he could keep it up for another fourteen years without extra payment, and it might stand in the way of others' progress. The whole question of patents has two sides, and there is much to be said for the view that the mania for inventing is, in its way, as prejudicial as the gambling spirit to the cause of plodding industry. It is a mania from which at least the average professional man may well pray to be delivered; for an invention too often masters a man, and keeps his mind riveted to one idea, whereas without it he might have developed into an infinitely more useful member of the industrial community.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 981.)

Business in the Stock Exchange during the past week presented a marked contrast to the course of affairs in its predecessor. There was quite a revival of that activity which had deserted nearly all the markets; and prices were firmer almost all round. The Gas and Water Department, however, took the opposite turn, and were much quieter than they have recently ruled. As for the Water Companies, it may be said that they never had a more stagnant time; for, with the exception of a little business done on Monday and Tuesday, not a single transaction in any one of the Metropolitan undertakings was marked all the week, and only one or two in Foreign enterprises. Returning to the Gas Companies, business was extremely limited; and changes of quotation are inconsiderable, both in number and degree. They are irregular as well; showing slight gains here and slight losses there. Gaslight "A" opened rather weak, and the price was put down 1, with business done at 244½. But it went no lower; and though there was less activity in it during the rest of the week, the tendency was in favour of a shade more firmness. The preference issues were generally better, and some of the 10 per cents rose 2. South Metropolitans were fairly dealt in during the earlier part of the week, and prices were not bad; though the "B" was put 1 lower. Nothing at all transpired in Commercials until Saturday, when the old stock was done at 245. On the same day, Gaslight "A" was done at 246; and we believe that this is the first time (certainly the first within our recollection) that Gaslight has marked a higher price than Commercial. As to which of the two is the better stock in our opinion, we made some remarks last week. Suburbans and Provincials were quite a blank so far as business done is concerned; and the only feature is a further drop of ½ in Alliance and Dublin. In the Foreign division, Bahia has suffered a considerable fall, as the dividend for the first half of this year will only be at the rate of 8 per cent. Imperial Continental, too, is rather flatter. The only advance is a rise of 1 in Australian debentures. The tendency of prices of Water has been downward; Chelsea and West Middlesex having receded 2 each. At the Mart, however, on Wednesday, £5000 of New River debenture stock realized more than the top quoted price, 130.

The daily operations were: Fair activity in Gas on Monday, mostly in Gaslight "A," Imperial Continental, and South Metropolitan "B." Prices were but moderate; and Gaslight "A" stock fell 1. But the "C," "D," and "E" rose 2. Gas was quieter on Tuesday; but prices were a shade better, though Imperial Continental fell 2. South Metropolitan "B" also fell 1; but no business was marked. There was nothing remarkable in Gas on Wednesday; but Imperial Continental recovered 1, while Gaslight "A" was 1 lower. Thursday was very quiet, but prices were steady. Alliance and Dublin and Pará receded ½ each. Still very little doing on Friday; but Gaslight "A" and Australian rose 1 each. Bahia fell 3. On Saturday, everything was quiet and unchanged.

ELECTRIC LIGHTING MEMORANDA.

A DEFECT IN THE ELECTRIC LIGHTING ACT AND ITS CONSEQUENCES—THE MEETINGS OF THE SWAN ELECTRIC LIGHT AND WOODHOUSE AND RAWSON COMPANIES—ELECTRIC LIGHTING BY THE ANGLO ROMANO GAS COMPANY.

When the Electric Lighting Act was last amended, it was still left with one defect which the experience of local authorities all over the country is now demonstrating. It permits adventurous companies to terrify corporations and local boards out of their wits by threats of intended applications for Provisional Orders; and for this evil there is no apparent remedy. It costs nothing for a company without a penny of legitimately subscribed capital to send these notices to the four corners of the country, merely on the "off chance" that something may come of them to repay the postage. There is scarcely a local authority in the land that has not been made the recipient of at least half-a-dozen of these unwelcome missives; and although they know that the senders have no backing, and cannot mean business, they are afraid to disregard them, lest they should incur the reproach of allowing the strangers to come in and cut up their streets. Consequently, much against the grain, the puzzled authorities in many instances apply for an Order themselves, as the most obvious means of self-defence. Thus we can explain the origin of the 300 applications which the Board of Trade have to dispose of for the coming session. Some of these emanate doubtless from promoters who really seek to try their luck in the new business; but many more, we suspect, come from worried corporations who will only be too glad if, through non-compliance with Standing Orders or other technical flaw, their venture is perforce postponed for another year. As it is, they resemble timid skaters on the ice, in the half-heartedness of their progress and their longing looks to the shore. It is all due to the speculative companies, who would have been effectually "choked off" if it had been necessary to deposit with every notice a small returnable fee by way of caution-money. The electricians who act in this way look for their profit in one or two results. They may either frighten their victims into making a compact with them, which would lead to the floating of a local company; or they hope that if the local authority take the matter of electric lighting in hand themselves, they may "stand in" to get a good line or two out of the heavy orders for plant that must be given out. It is a merry

game while it lasts; but the trouble and vexation caused seem out of all proportion to the prospect of profit to be realized.

The meeting of the Swan United Electric Light Company has been held; and the figures mentioned in these columns last week have been duly explained to the assembled proprietors, and commented upon by the Chairman (Mr. J. S. Forbes), who has become almost as indispensable in the electric lighting as he has long been in the railway world. Mr. Forbes was naturally jubilant at being able to recommend the payment of a dividend; declaring that the occasion was a "red-letter day" in the history of the Company. He claimed that the concern is now standing upon firm ground; having cut away a good deal of the incumbrances with which the Company started on their career. At the same time, he was compelled to admit that their future depended upon the results of their investments in the two related Companies—the Edison and Swan and the Compagnie Générale of France—in which they are so deeply interested. As the Continental patents have only four or five years to run, and the end of the litigation respecting them is not even in sight, this prospect is not quite so bright as it might be. Still, Mr. Forbes is hopeful; and it would be cruel to deny to anybody committed to the electric light business that heritage of the future in which they all profess such a touching degree of confidence.

The first statutory meeting of the Company into which all the various Woodhouse and Rawson undertakings have been merged, has been held, under the usual pleasant circumstances attending successful transactions of this nature, when everybody is pleased at the conclusion of important financial and administrative reforms, and looks forward to a prosperous future. Gas companies, in London particularly, have gone through so much in the way of amalgamations that they may well have a fellow-feeling with the Woodhouse and Rawson people in this matter, although the conditions of the two different orders of consolidation are so very dissimilar. The fusion in the present case is that of a manufacturing company with a supply company, and again with a contracting concern, and with several foreign businesses. The scheme is very complicated, as we have remarked on previous occasions; but if the shareholders are satisfied, as they appear to be, it is not for anybody else to find fault with the proceeding.

Some notice was taken by the newspapers last week of the prospective expansion of the electric light branch of the Anglo-Romano Gas Company. It has been stated that a contract has just been signed between the Municipality and the Company for the replacement of 706 gas-lamps in the streets of the city and suburbs by 167 electric lamps, at an increased annual charge of 26,000 frs. This may be all very right and proper in the interest of the Gas Company; but we consider that it has yet to be proved to be the true course for them to pursue. It does not read aright, somehow, for a Gas Company to give up their gas lighting to this extent, even for a prospect of increased revenue by other means; and if the Anglo-Romano Company had happened to be a concern administered in accordance with English ideas, we should have more to say on the matter. There being little English about the undertaking, however, except half the name and nearly all the capital, it is not of much use to discuss the policy to which it seems to be committed. It is more than probable that as the Company became further involved in their new adventure, they will lose interest in the development of their old business.

The Continental Union Gas Company, Limited, have announced a dividend of 13 per cent. on the ordinary, and 10 per cent. on the preference shares, payable on the 4th of January, less the interim dividend already paid.

The Directors of the Monte Video Gas Company, Limited, have declared an interim dividend of 12s. per share, free of income-tax, in respect of the half year ended the 30th of June last, being at the rate of 6 per cent. per annum.

In addition to the paper on the Dinsmore process which Mr. Isaac Carr, of Widnes, is to read on the 4th prox. before the Liverpool Section of the Society of Chemical Industry, as announced in the Journal last week, he will read one on the same subject at the meeting of the Manchester District Institution of Gas Engineers on the 30th inst.

Last week, a Company was registered, under the title of "Van Steenbergh's Carburated Gas Syndicate, Limited," with a capital of £10,000, in £10 shares, to carry on business as gas manufacturers, in accordance with an agreement entered into between B. van Steenbergh and James Andrews. We hope to give next week some particulars as to the process which the Company has been formed to work.

At last Friday's meeting of the Finance and General Purposes Committee of the Bradford Town Council, the question of the relationships between the Corporation and the Water Engineer (Mr. A. R. Binnie, M. Inst. C E) was raised, in view of the appointment of an Engineer to the London County Council (for which office Mr. Binnie is an applicant) now pending. It was generally understood that Mr. Binnie is anxious for the re-adjustment of his professional relationships with the Town Council; and, after considerable discussion of a friendly character, the Committee agreed to the appointment of a small Committee to confer with Mr. Binnie, and ascertain whether or not means can be devised whereby his professional services can be retained till the completion of the new scheme of water-works for the borough, for the carrying out of which authority will be sought in the ensuing session.

IS WATER GAS POSSIBLE FOR BRITISH GAS-WORKS?

The long discussions on the subject of water gas that have occupied the space of the Journal for some time past afford a sufficient indication that engineers are deeply interested in the matter. We propose now to devote a few remarks to a phase of the controversy that has not been quite fully considered—the prospects of the adoption of water-gas plant in British gas-works. It is true that a good deal of discursive criticism has been addressed to this branch of the question of water gas; and, as our report last week shows, it exclusively occupied the attention of Mr. J. F. Bell when speaking at the recent meeting of the Midland Association of Gas Managers. Mr. Bell then "ran amuck" against water gas and all its supporters; but we do not misrepresent the temper of the meeting in asserting that it was far more in favour of Mr. Hunt's view as to the desirability of keeping an open mind on the subject than of the over-confident attitude taken up by Mr. Bell. The latter was doubtless justified in his conclusions, if his premises are acceptable; but this is the point which we are about to raise. There is an evident air of sincerity about all Mr. Bell's utterances, but it is at least questionable whether he does not permit conviction to pass into "cock-sureness," which always arouses opposition. It is not with a desire to oppose Mr. Bell, however, that we offer this contribution to the literature of the subject. What he thinks and says with regard to the idea of making water gas in British gas-works is no more in essence than what almost every British gas manager holds more or less clearly at the present moment. He has made a definite, unmistakeable, and uncompromising statement of the case for the indefinite exclusion of water gas from British gas-works. We shall not set ourselves to refute him, but only to state the case for the other side, as it stands at the present time and may develop in the not distant future. The ultimate verdict is not for either side to anticipate with excess of confidence.

The general case of water gas for Great Britain comprises the consideration of the various elements of carbonizing improvement, value of coke, and price of hydrocarbon required for carburetting the non-luminous product of the cupola to the point of equal luminosity with the coal gas usually supplied. In the first place, it would be unreasonable to argue the matter as if it was a case of the complete substitution of water gas for coal gas. We shall therefore treat it as a problem of the auxiliary use of the new variety of gas. This would mean in most instances the erection of some approved form of water-gas generator in a spare corner of a retort-house. With regard to the selection of an apparatus of this order, there is nothing to be said. As the matter was stated to us by an American authority who had no great interest in any special process or system, "selecting a water-gas plant is like choosing a horse." One may be a little better for some reasons than another, but the difference does not amount to anything noticeable as between the best patterns of this kind of plant. The plain fact of the matter to be borne in mind is that any manufacturer of repute will guarantee a duty of 45 lbs. of ordinary gas coke to 1000 cubic feet of water gas produced, including everything. This means (say) an average yield of 30,000 cubic feet of water gas from the coke produced by the carbonization in the ordinary retorts of a ton of coal, which may be taken to be worth to the maker 6s. in London. As for the carburetting, it is on record that from 4½ to 5 (American) gallons of crude Lima oil—which, being unfit for refining, is delivered into any gas-works in the United States or Canada for from 1c. to 1¼c. per gallon—will carburet 1000 cubic feet of water gas to an illuminating power of 26 or 27 candles. As no gas manager south of the Tweed, and not many beyond, requires to sell gas of such high photometrical value, we may take it that not more than 4 gallons of the same hydrocarbon would render 1000 cubic feet of water gas so brilliant that no gas consumer in the kingdom (or photometrist either, for that matter) could distinguish it from ordinary coal gas. Now, if crude Lima oil can be sold, *ex* tank trucks, in ports on the Atlantic seaboard for 1c. per gallon, as we are assured is true on the same authority as that before referred to, it ought to be brought to any large English port in tank steamers for another cent per gallon, which is somewhere about 10s. per ton for freight and all charges. This amounts to 1d. per gallon for the total cost of this description of oil put into tanks on a riverside gas-works. We can now estimate the cost of the extra 30,000 cubic feet of carburetted gas as being made up of coke, 6s.; crude oil, 120 gallons at 1d., 10s.; labour, say half that for coal gas, and the purifying charges, wear and tear, &c., the same—say, for all manufacturing charges, 6d. per 1000 cubic feet, 15s.—total 31s., or 1·033s. per 1000 cubic feet in the holder. For materials alone, without reckoning anything else, if these data are admitted, 18 to 20 candle power water gas would not cost more than 2·4d. per 1000 cubic feet for coke, and 4d. per 1000 cubic feet for oil—say, 6·4d. altogether. Where in the United Kingdom does coal gas cost less? If we consent to put another ¼d. per gallon on the cost of the hydrocarbon, to make its initial cost free on board as high as the price paid by any American gas company, however distant from the centre of production, it amounts to no more in the end than 8·4d. per 1000 cubic feet, as to which the question may be repeated.

These are startling figures; and we confess that until the last week or two we did not suspect that the problem had been narrowed down to anything like these data. It may be objected that nobody has ever bought the American hydrocarbon in England at the price we now give; but the answer to this is that nobody has wanted it. It is not an article of commerce except locally in America for fuel and gas-making purposes; and any British gas

company requiring a supply would have to arrange for it with the Standard Oil Company and owners of tank steamers. Once the latter were put on the line, there would be no difficulty about freights. As to the sufficiency of the supply, it is currently held in the States that this may be left to the care of the next generation. The gas-making oil we refer to is available without interfering with the wells that yield refinable oil for burning purposes. It is known throughout North America as Lima oil, from the name of the district in Ohio whence it is obtained. Many attempts have been made to refine it, but without commercial success; and the idea is now given up. The supply is believed to be practically inexhaustible. There is no need, however, to contemplate total dependence upon the United States for the supply of hydrocarbon. Sooner or later the pipe-line from the Caucasian oil region to the Black Sea will be made; and refineries will be set up there instead of on the Caspian, where the outlet for their refuse is so restricted. Professor Mendeleeff, the adviser of the Russian Government on the petroleum industry of the Empire, asserts that Caucasian oil will never be more than half the price of American oil, and the freight from Batoum to England will be at least one-third lower than from Philadelphia. This opens out the prospect of obtaining crude Caucasian petroleum in England for something less than ¾d. a gallon. In these circumstances, who will take upon himself the responsibility of denying that water gas for British gas-works is even now "something to figure upon," as the Americans would say?

We mentioned the improvement of carbonization methods as having something to do with the prospect of the adoption of auxiliary water-gas plant in this country. It is impossible to look at the Coze system of inclined retort-settings without being struck with the possibility of combining this plan with a water-gas generator to take the coke as it falls from the sloping retort. This idea, as we remarked last week, is at the bottom of most of the American devices for making fuel gas out of caking coal, which cannot be gasified satisfactorily in a cupola unless with a downward draught, as practised by Mr. Loomis. It recommends itself in connection with a gas-works, however, because the otherwise wasted producer gas can there be used in heating the retorts. A combined apparatus of this kind would present problems in labour-saving design which would delight an ingenious gas engineer, and might be constructed to generate a mixture of coal and water gases at a cost comparing favourably with anything that has hitherto been done. The extent to which the coke produced by the retorts should be gasified is a point on which nobody would care to dogmatize, especially as the withdrawal of a large proportion of it from sale would naturally enhance the value of the remainder. This again would react in making the water gas appear more costly; so that it would be necessary to bear in mind the whole circumstances antecedent to the adoption of the new process, in order to judge it fairly.

This is running ahead of the argument, however, which, as we now state it, is only intended to show the best that can be brought forward on behalf of water gas for English gas-works—at least, for those in connection with seaports. Mr. Bell was too sweeping when he was laying down the law of the eternal inadmissibility of water gas in England; but it may well be conceded that in places situated like Stafford, such things as tank steamers may be excusably regarded as appertaining to another state of existence. Yet the capabilities of canals, to say nothing of railways, are not to be ignored.

In concluding for the present, we may fall back upon the statement of Mr. Loomis—that any gas engineer, when he first sees water gas as used in New York and other places for lighting, will say at once that it is a "pretty gas." The spectacle, moreover, of a gas plant tended by cleanly-dressed mechanics, whose duties embrace nothing more onerous than opening and closing sets of valves at certain intervals, while the rough work of charging is represented by the occasional tipping of a truckload of coke and coal into a yawning cupola, is one that has its charms for a much-worried manager, who finds men considerably more troublesome than matter. In connection with this aspect of the question, we cannot refrain from repeating a story told to us by a Pennsylvanian engineer: "In Philadelphia," he said, with a twinkle in his eye, "the gas-works were a municipal affair. Consequently, the main object was the manufacture of voters; gas being a bye-product. One of the Commissioners paid a visit of inspection to a New York water-gas company's works, and seeing only an odd man or two about, he asked the superintendent, who was showing him round, whether it was the men's dinner hour. 'Not at all,' was the reply; 'they are all here, and we are in full work.' The Commissioner halted, and said, with a shake of the head, 'I don't want to see any further. I am convinced that this process would never do for Philadelphia. Why, we've got thirty wards to consider; and you haven't men enough to work one of them!'" The moral of this story, as Captain Cuttle would say, lies in its application. The fact remains that water gas has gone in, and stokers have gone out from many other places in the United States and Canada besides New York; and now that the gas supply of Philadelphia has passed into the hands of men of business, *vice* politicians superseded, a like thing has happened there.

We have now stated the case for water gas *versus* coal gas in England—not considering the two ideas as antagonistic, but only as complementary to each other. If we have overstated it, we can only promise that any correction shall be duly regarded. If the effect of this contribution to the discussion of the subject is to show that the argument is not all on one side, it is as much as we can expect. Perhaps when some of our enterprising gas managers come to take the subject in hand practically, they may advance the question far beyond the utmost extent of present probabilities.

Proposed Trial of the Pease System of Gasholder Guiding.—It is announced that the Haslingden Gas Company intend to erect a new gasholder on the principle invented by Mr. Pease, and recently described in the Journal. The Company's Manager (Mr. W. H. S. Gendall) is to be complimented on the spirit he is displaying in giving the new plan a trial.

South African Lighting Association, Limited.—According to some figures which have reached us in reference to the working of the above-named Association, its operations at Port Elizabeth are making very gratifying progress. The Association's financial year begins in November, and the figures obtained for the ten months closing in August last were most satisfactory. The consumption of gas shows an increase of 25 per cent. over the same period of last year. The gas-rental will amount to £7200; and —a very healthy sign—the fitting business has reached the large figure of £1178. This steady growth of business cannot fail to continue with the expanding trade of Port Elizabeth. The current year will show an unusual increase, because, as the result of a very decided expression of opinion on the part of the inhabitants, the Town Council have resumed the public lighting of the streets with gas, which had been suspended for some few years. This means an addition of about 20 per cent. to the ordinary output. The Association has now been firmly established; and its prospects in the immediate future justify the belief that it will be a thoroughly successful undertaking.

Suffocated in a Gas Producer.—An inquest was held at Bolton last Tuesday on the body of Michael Riley, 36 years of age, described as a gas maker, who was found dead in a gas producer on the works of the Bolton Iron and Steel Company. Deceased and his brother were employed at the works named to look after the apparatus. On the previous Saturday deceased went into a producer, which had been disused for 18 months, with the object of cleaning it ready for re-use. He was assisted by a man named Glossop, who remained outside to render assistance. After the first 10 minutes, Glossop heard no noise of scraping, and failed to get an answer when he called to deceased. He did not, however, suspect that anything was wrong, and did not raise any alarm until deceased's brother came to work a quarter of an hour later. The man was then brought out dead from suffocation. The evidence of the dead man's brother went to show that the producers had to be cleaned out every two months; and that he had taken out two or three men who had been overcome by the fumes of gas. The jury returned a verdict in accordance with the facts related, and recommended that in future means should be taken to enable the men entering the producers to communicate with those outside.

Mr. Ellis Lever and the Salford Scandal.—Writing early last week our Manchester Correspondent said: The *Salford Reporter* is responsible for one of the most extraordinary of the whole series of statements published since the first hint of the Hunter scandal was heard. As your readers well remember, the Consultative Committee of the Salford Corporation accepted, in August last, the sum of £10,000 in full and final settlement of the civil actions taken by the Corporation against Hunter for commissions alleged to have been paid to him by certain coal and cannel contractors. This Committee subsequently made a report, in which there was the following paragraph:—"Negotiations for such settlement have been pending since that time, and ultimately the Town Clerk received such information from Hunter as will enable him to pursue the present proceedings, and have secured to the Corporation a guarantee (accompanied by a deposit of securities) that the sum of £10,000 will be realized; and on such realization, your Committee have undertaken to release both Hunter and the contractors from further claims in connection with the matter." The names of several contractors against whom proceedings were begun were then mentioned. The *Reporter* now gives an "explanation" of this paragraph, from which it appears that some contractors who paid commissions "now refuse to contribute their quota towards the £10,000." Hunter has consequently "given such information to the Corporation as to enable the Town Clerk to institute proceedings for the money alleged to have been paid by them" in bribing Hunter. "One of these alleged bribers is," says the paper in question, "Mr. Ellis Lever, against whom a writ has been issued by the Town Clerk for the return to the Corporation of a considerable sum of money which Hunter states that he has received from him." On Saturday our correspondent wrote that, according to a Salford newspaper, the writ issued by the Salford Corporation against Mr. Ellis Lever for the recovery of moneys alleged to have been paid by him to Samuel Hunter in respect of coal and cannel contracts held under the Corporation had been served in accordance with the requirements of the statute. Although Mr. Lever is himself away from town, it is reported that his Solicitors (Messrs. Dendy and Paterson) have entered an appearance to the writ. The amount claimed is between £2000 and £3000. The Corporation are understood to be acting in this matter, on information supplied to them by Hunter. The proceedings, which are taken in the Chancery Court, will be hastened on with all speed. "The issue," says the paper referred to, "will be awaited with keen interest by the public; for if it be established to the satisfaction of the Court that Hunter was bribed by Mr. Lever, the latter will cease to be an object of popular sympathy."

GAS *V.* ELECTRICITY FOR THE PUBLIC LIGHTING OF PARIS.

It will doubtless be in the recollection of our readers that early in the present year the Paris Municipality decided, with the view of adding to the attractions of the city during the period of the exhibition, to illuminate some of the principal boulevards by the electric light. The portions selected were, of course, those which are always most frequented—viz., the boulevards forming a continuous line westward from the Porte St. Martin to the Madeleine—a distance of rather more than a mile and a half; and in order to give a good "finish" to the scheme, the Rue Royale (which is a kind of connecting link between the western end of the boulevards and the Place de la Concorde) was included. In due course the lamps were put up; the position determined upon being the centre of the roadway. They were all arc lights, placed on ornamental posts considerably higher than those used in ordinary street lighting. In view of the decision of the Municipality, the Paris Gas Company applied for, and were granted permission to show what could be done in the way of public lighting by means of improved gas lamps and burners. The places selected by them for their demonstration were the Rue de la Paix and the Avenue de l'Opéra—two fine streets running at angles from the Place de l'Opéra, on the line of boulevards already referred to, southward towards the Seine. The avenue, it may be remembered, was the scene of the earliest electric street lighting experiment in Paris, one result of which was to rouse the Paris Gas Company to light the adjacent Rue du Quatre Septembre with a new high-power burner to which they gave the name of the street. The area lighted by the Company in the Rue de la Paix is 5152 square metres (1 square metre = 1·2 square yards); and there are employed for the purpose 117 burners of the "Parisien" type, giving the light of 6 Carcels, or 57 candles, taking the Carcel as equal to 9·5 candles, with a consumption of 350 litres, or about 12 5 cubic feet of gas. These burners have taken the place of a similar number, giving the light of 1·1 Carcels, with a consumption of 140 litres of gas. The total quantity of gas consumed by the new burners is about 2½ times as much as was burnt before; but the amount of light yielded is 5½ times greater—being 0·138 Carcel, as compared with 0·025 Carcel, per square metre of surface. In the Avenue de l'Opéra the superficial area illuminated is altogether 20,940 square metres, for which there are employed 189 "Guibout" burners, each of them giving the light of 11 Carcels with a consumption of 550 litres of gas, and seven burners of higher power, each yielding 27 Carcels with 1200 litres. The 189 burners replace a similar number of ordinary 5-feet burners; and the seven of higher power are in substitution of burners which, with a consumption of 1400 litres of gas, gave the light of only 13 Carcels. The total quantity of gas consumed in the improved lighting is rather more than three times as great as before; but by the employment of better types of burners, it is made to yield 7½ times as much light. With regard to cost, for the Rue de la Paix it works out (at 15c. per cubic metre, the price charged to the Municipality) to 0·87c. per Carcel-hour; and for the Avenue de l'Opéra to 0·74c.

It will now be interesting to compare, on all points, these improved systems of gas lighting with the electric lighting in the Rue Royale. This, as those of our readers who have visited Paris will remember, is the rather broad street, about 350 yards in length, extending from the front of the Madeleine Church straight into the Place de la Concorde. It is an important thoroughfare, and one which has figured conspicuously in most of the internal troubles which have from time to time convulsed the city. All through the day, and even well into the night, there is a continuous stream of vehicles passing along this street on their way to and from the Champs Élysées; and during the exhibition the traffic in the evening was very heavy. The area illuminated is 10,500 square metres, or about 12,500 square yards, in extent; and there have been employed for the purpose 25 electric arc lamps, each of 70 Carcels, or something like 660-candle power. This works out to about 0·160 Carcel per square metre, as compared with 0·108 Carcel for the Avenue de l'Opéra, and 0·138 Carcel for the Rue de la Paix. With regard to expense, the electric lighting in the Rue Royale costs 55c. for 75 Carcels, or about 0·73c. per Carcel-hour, against 0·74c. for the Avenue de l'Opéra and 0·87c. for the Rue de la Paix. These figures, at first sight, show slightly in favour of the electric light; but it should be borne in mind, as pointed out by our contemporary the *Journal de l'Eclairage au Gaz*, that the calculation of the comparative expense of the two modes of lighting is not founded upon actual cost prices, and therefore the figures arrived at could not serve as the basis of a working contract. The Editor of the above-named publication maintains that, taking the net cost on both sides, including interest on the capital outlay, the trials here referred to would show an economy of about 50 per cent. in favour of gas. With the net price arrived at, it is, of course, open to anyone to add thereto whatever profit he expects to realize.

So much for the comparative efficiency and the cost of the two systems of lighting. It remains now to deal with the question of convenience and reliability. The warmest partizans of electric lighting are compelled, by force of circumstances, to acknowledge that, like Homer, it "sometimes nods," and occasionally does more—it goes to sleep, to the great inconvenience and danger of those who are dependent upon it. The electric lighting on the boulevards of Paris has been no better in this respect than some other installations that could be named; and, as the gas-lamps were dispensed with, if it had not been for the lavish use of gas by the shopkeepers, serious accidents might have resulted. From the point of view of reliability, therefore, the electric light does not commend itself to the Municipal authorities for permanent adoption on the boulevards; and it is doubtful whether, at the termination of the existing contracts, they will be renewed for the winter season, when there is the greatest need of light, and when, consequently, sudden extinctions are so much the more to be feared. As an additional feature of attraction during the period of the exhibition, the electric light on the boulevards had a *raison d'être*. While the City was "bagging" the money spent by the five million provincials and the million and a half of foreigners who visited the great show in the Champ de Mars, her rulers could afford to be a little extravagant in the way of illumination. But will they care to be equally lavish now that the excitement is over, and the "brilliant dream," as it has been called (though it must be confessed that there was a very substantial element of reality about it) has almost faded away? One is inclined to think not; and if this should turn out to be the case, will any attention be given to the older and less tricky illuminant, with the view of seeing what can be done to employ it to the best advantage on the boulevards? The gas lighting in the two thoroughfares already referred to is evidence of the capability of gas to fulfil all the requirements of a public illuminant; and the Municipal authorities are about to show their confidence in it by adopting a new type of high-power burner—the "Industriel"—for the lighting of the Place de la République, in substitution of the burners now in use there, which are of the kind already referred to as having been introduced a few years ago for lighting the Rue du Quatre Septembre. The old 1400-litre burners will be replaced by "Industriel" burners consuming 1200 litres of gas per hour; and the 875-litre burners by those passing 750 litres. When this change has been effected, the total quantity of light afforded by the new burners and lamps will be about three times as great as by the present appliances; and at the same time there will be a saving of 62 frs. per annum in the cost of the gas consumed in each of the lamps. One of these burners, passing 1200 litres of gas per hour, has been tested photometrically against one of the Edison electric lamps on the boulevards; and the latter was found to possess 1½ times as much illuminating power as the former. But then the Edison lamp costs 59c. per hour; whereas a gas light having the same intensity could be obtained with Paris gas for 23c. It would therefore be possible for the Paris Municipality to have twice the present amount of light on the boulevards by using high-power gas-burners and lamps of the most improved type, and at the same time effect an economy as compared with the cost of electric lighting Whether or not they will avail themselves of these appliances remains to be seen.

Fuel Gas for New York.—According to the New York *Sun*, the next innovation that is likely to be "sprung" upon the city is the use of fuel gas. It appears that some capitalists have acquired the patents for a process for the manufacture of fuel gas from anthracite and asphalte, with hydrocarbon enrichers. It is claimed that the product is a non-condensing, tenacious gas, more closely resembling natural gas than any other artificial production. Of course, the method of delivering the new gas into the city has not been made known; but it is evidently intended to do something with the scheme, as a Company, under the title of the National Heat and Power Company, has been formed to work it.

The "Baker" Combined Gas Exhauster and Engine.—A neatly-designed arrangement of gas-exhauster combined with a vertical engine has lately been constructed by Messrs. F. B. Welch and Co., of the Atlantic Works, Manchester, for use in a Scotch shale-oil works, where it will run continuously day and night. The engine and exhauster are mounted on a strong wrought-iron framing, with the engine fly-wheel located between them. The whole appliance is of simple and strong construction, and being fitted on a wrought-iron underframe, planed on the top, and fixed metal to metal, a very rigid arrangement is obtained. The engine and exhauster are connected by a simple and effective flexible coupling, so that the internal parts of the exhauster have a perfectly free end movement.

The Overhead Wire Difficulty in New York.—The result of the order lately given by the Mayor of New York for the prompt removal of dangerous overhead electric wires and poles, was an application by the United States Illuminating Company for an injunction to prevent the city authorities from interfering with them; and it was granted. A recent decision of the Supreme Court continues the injunction, with certain modifications, until an action which has been instituted in regard to this matter has been tried. The Court held that, as a police regulation, the Legislature could undoubtedly compel the above-named Company to put their wires underground; but could not, in the same breath, order all the companies to do so, and then, having refused to give them permission to construct subways, and no subways having been provided, direct or permit the Board of Electrical Control to destroy millions of property, without notice or without compensation. The Judge said he thought the companies had a clear legal right to the poles and overhead wires, and that the resolution of the Board of Electrical Control requiring the electrical currents to be turned off, and the Mayor's order to the Commissioner of Public Works to remove the poles and wires, could not stand. In view of the necessity of getting the wires underground as soon as possible, the Aldermen have passed a resolution granting the Board of Public Works permission to issue permits or to extend the limit of those issued for roads to be opened for subway construction.

Notes.

The Permanence of Baku Petroleum.

Professor Mendeleeff has written to Mr. Ludwig Mond, as Past-President of the Society of Chemical Industry, with reference to the recently circulated rumours of the approaching exhaustion of the supply of crude oil in Baku. He states that these rumours originated four years ago, at which time Messrs. Nobel and Ragosin proposed the levying of a tax on the crude oil, and a demand was made for power to expend an enormous sum in exploratory borings to find additional sources of supply. The Russian Government sent Professor Mendeleeff to investigate the matter; and he then found that not a single trustworthy symptom of exhaustion of the Baku naphtha region had presented itself. Some of the first-worked shallow wells have dried up; but cessation of the profitable yield of some of the deeper wells has been proved to be owing to obstructions in the way of the flow of oil to them, for new borings close at hand have often yielded naphtha in abundance. The pumping of the naphtha from the existing wells is not regularly conducted, but increases during the summer months, and sometimes ceases altogether in the winter. Many wells are not worked at all unless the price of oil rules comparatively high. The maximum possibility of the Baku region in the production of oil has never been reached as yet; only a small number of wells being worked in comparison with the extent of the oil-bearing lands. It will only be when the pipe-line to the Black Sea is made that the full productiveness of the Baku region will be tested; and even if this field should be exhausted, there are others yet untouched in the vicinity. After all, judging from the geological recency of the oil-bearing formations, Professor Mendeleeff is not at all certain that the production of naphtha by underground processes is not even now going on. At all events, he sums up an interesting report by reiterating that the Baku oil-field shows no signs of exhaustion up to the present time; and he concludes that naphtha from the Caucasian district will always be one-half or one-third cheaper than the American product, which he believes it is bound to supersede eventually.

A New Chemical Photometer.

It is reported in the *Revue Industrielle* that M. Léon utilizes for photometrical purposes the decomposition by light of ioduret of nitrogen, prepared by the action of a pure aqueous solution of ammonia at 22° upon iodine. M. Guiard has shown that this body, remaining among the products of its formation, decomposes slowly, with the disengagement of nitrogen proportional to the intensity of the incident light. His photometer is based upon the comparison of the volumes of nitrogen produced, from equal periods, under the influence of the light to be measured and that of a standard light. M. Léon indicates an arrangement which provides for the comparison of the illuminating power of two sources of light by means of two closed burettes containing equal quantities of the reagent, and put in communication by a capillary tube containing a mercury index. The burettes being subjected independently to the action of two lights, a difference in the two disengagements of nitrogen will produce a displacement of the index. To effect numerical comparison, it will suffice to vary the distance of one of the two light-sources from the burette corresponding to it, until the index returns to zero.

The Action of Sulphate of Ammonia in the Soil.

Some uncertainty has prevailed respecting the form in which nitrogen applied in the form of ammoniacal manures is absorbed by the roots of growing plants. It was at one time generally believed that the nitrogen of organic matter went directly to the nutrition of vegetation; but it was demonstrated by Boussingault that it is only in a mineral form that nitrogen is so utilized. When nitrate of soda was first used as a nitrogenous manure, it was thought by Kuhlmann that this preparation became transformed in the soil into ammonia before being absorbed by the plants. Latterly, however, it has become the generally accepted theory that nitrogen is assimilated under the form of nitrate; which magnifies nitrate of soda in comparison with sulphate of ammonia. It is evident, remarks M. Muntz, in a communication which recently appeared in the *Comtes Rendus*, that when sulphate of ammonia is applied to vegetation, its effect can be easily perceived; but the question arises whether the ammonia acts directly, or in the form of a nitrate produced by its mixture with the soil. To determine this point, experiments have been made with soil and seed manured with sulphate of ammonia, and deprived of the conditions of nitrification. These trials were carried on from 1885 to 1888; and the results showed perfectly clearly that the sulphate of ammonia of itself sufficed for all the needs of the vegetation fed with it. It may therefore be considered proved that preliminary nitrification is not a condition essential to the usefulness of this manure.

Portland Cement Wash for Wood and Iron.

Among the good applications of Portland cement in works and engineering structures is the coating of wood. According to the *Bauzeitung*, wood to be coated with cement should be rough; and the best coating is produced by a mixture of one part of cement, two parts of fine sand, and one part of curdled milk. Not more of the composition should be made at a time than can be used in half an hour; and, during application, it should be continually stirred to prevent the sand from settling out. It is better to lay on two coats, the second thicker than the first. Such a coating adheres well to wood, which it effectually protects from rot. Woodwork exposed to the risk of charring from the vicinity of fires, gas lights, &c., may also be to a great extent protected in this way. Another mixture for the same purpose may be made of good fresh cement and curdled milk, worked up together until as thick as oil paint, and then applied to the wood. This mixture will be smoother than the other; but, of course, will not go so far. It is a good mixture also for ironwork exposed to the weather.

The Spectra of Hydrogen, Coal Gas, and Water Gas.

Some interesting observations on the spectra of hydrogen, coa gas, and water gas have been made by MM. Thomas and Trépied, who have made the gases luminous by simple elevation of temperature, and not (as has been done before) by the electric discharge in Plücker's tubes. They treated the gases exactly as a metal or metallic salt, by bringing them between the two carbons of an electric arc lamp. An annular pipe conveying the gas was made to encircle the carbons, from which four equi-distant jets, directed towards the centre of the arc, brought the gas to the point of observation. The regulation of the gas was a difficult matter, to avoid breaking the arc; but in the end an arc of sufficient steadiness was obtained, burning in the midst of an atmosphere of the gas to be examined. The two hydrogen lines appeared when the image of the arc so constructed was projected upon the spectroscope, one of them with a brilliancy comparable to that of metallic radiations. Another appeared to resemble an obscure radiation in the solar spectrum. Several other observations were made upon these lines, in connection with appearances in the spectra of the sun's disc and chromosphere. The appearances were much the same when coal and water gas were substituted for hydrogen; but it is remarked that the employment of the water gas was much less easy, and required special apparatus.

Communicated Article.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

XXXII.

The endeavour to utilize oil as a gas-producing material may be said to date back nearly to the beginning of the century. At that time, when the chemistry of coal carbonization, condensation, and purification was in its infancy, and consequently the working expenses connected with the production of coal gas were high, oil had an excellent chance. The ease with which the fluid material could be manipulated, the high quality and purity of the gas produced, and other considerations, stood so far in its favour as to lead many practical engineers to suppose that it might successfully be employed as a competitor against coal. Not to occupy time unnecessarily in quoting historical facts, an article extracted from *Newton's London Journal of Arts and Sciences*, which appeared in the Journal,* may be referred to as giving a fair idea of the position of oil gas, from a practical point of view, in 1856. From this we gather that Messrs. Taylor and Martineau, in 1824, used retorts packed with broken brick or pieces of coke, and so succeeded in completely gasifying the oil, producing a gas of such quality that 1 cubic foot of it was found to go as far as 4 cubic feet of coal gas. The retort was not completely filled with the packing, but a space was left at the end where the oil was admitted. The oil entered through a syphon tube, and fell upon an inclined plate, and was converted into vapour. The vapour was caused to pass through the broken brick or coke contained in the hottest part of the retort, and was thus decomposed and converted into permanent gas, which finally made its exit to the hydraulic at the other end. It was clearly understood that, in order to avoid the presence of a large quantity of undecomposed vapour in the gas—in other words, to secure destructive, and not merely fractional distillation—the liquid must first be vaporized, and that the vapours must be exposed for a sufficient length of time to a high temperature, higher than that necessary for vaporization. So the oil might be vaporized at one end, which would necessarily be the cooler part of the retort; and then be converted into permanent gas, by passing through the retort to the other end. As will be presently seen, all modern schemes or apparatus for manufacturing oil gas are based upon this point as a fundamental principle. The author of the article proceeds to inquire why oil gas had hitherto proved a commercial failure. The answer is that no kind of oleaginous mixture capable of generating good gas had yet been attainable at less than £8 per ton. A ton of the best cannel coal, costing say £2, would yield 14,000 cubic feet of gas equal in quality to the best oil gas. Assuming a yield of 100 cubic feet per gallon of oil, 140 gallons would be needed to produce a similar quantity of gas; and the oil must be sold at 3½d. per gallon in order to compete with the cannel. The question is simply a commercial one. It is as easy to make oil gas as coal gas; but coal is beyond all measure cheaper than oil. This was true in 1856; and it is equally true in 1889, so far as this country is concerned. The discovery of mineral oils and hydrocarbons in the United States, Russia, and other parts of the world in such quantity as to admit, not only of their sale in the more immediate neighbourhood, but of its transportation to considerable distances, has altered the position of petroleum and some of its products in the gas making scale. It is now used in gas-works in many parts of the world, but

* See Vol. V., p. 373.

chiefly as an enricher. The pure oil gas is too high in quality to be suitable for distribution in a general way, though it can be applied to special purposes, such as the lighting of gentlemen's mansions, railway carriages, &c. Attempts to distribute it at any distance are hampered by considerable condensation in the pipes, attended, of course, by depreciation in the quality of the gas.

A paper was read at the 1874 meeting of the American Gaslight Association by Captain W. H. White, on the subject of the gas producing capabilities of naphtha,* in the course of which he stated that the first process really tried on a commercial scale in America, was that known as the "Gale-Rand." The vapour of naphtha was "fixed" by being caused to pass through a red-hot retort; and subsequently diluted to the desired extent by means of atmospheric air. This venture was not a success. The mechanical mixture of the gas and air was not permanent, and stratification took place. The air greatly diminished the value of the gas; about 40 per cent. of air beng sufficient to reduce the illuminating value more than threefold, and was also objectionable as adding to an already excessive specific gravity. These experiments were useful in indicating the the value of naphtha gas as an enriching material, and also that their great specific gravity and richness in carbon required a diluent consisting of a light gas containing a large proportion of hydrogen. They showed, in fact, that the naphtha gas was of greater value when mixed with coal gas than when used alone. The next process brought out was known as the "Olney;" and it differed from the foregoing in that the diluent was added to the vapour before fixing. The liquid being placed in a still and heated to boiling point, the diluent, which might be air, water gas, or poor coal gas, was caused to bubble through it. The carburetted gas was conveyed to the fixing retort, and was found to yield good permanent gas, with much less deposit of carbon than in the Gale-Rand process. The diluent was useful as exercising a protective influence in this respect. Captain White applied this process successfully on a commercial scale, using a mixture of pure coal gas and water gas as the diluent. He found in practice that the condensation and consequent loss of illuminating power in distribution was less than with coal gas; and there was no evidence of anything in the way of stratification. The illuminating power was equally good over the entire district. In order to overcome the risks attendant upon the use of such inflammable liquid, he stored it in steam-tight iron tanks provided with vent pipes. From these it was conveyed by underground iron pipes to the stills, where it was vaporized at a low temperature and pressure. Working on this system, he put gas into his holders at two-thirds the previous cost of coal gas. The cost of labour was reduced one-half; and there was no need for lime purification. A great want in the manufacture of oil gas, was a cheap method of producing free hydrogen for use as a diluent. The naphtha cost 3d.; and yielded about 130 cubic feet of gas per gallon The quality of the gas as supplied to the consumers was 18 candles. A discussion followed the reading of the paper, in the course of which Mr. Edgerton stated that ordinary petroleum would yield 80 cubic feet of 80-candle gas per gallon. Consumed at the rate of 1 cubic foot per hour in a suitable burner, a light equivalent to 15 candles was obtained. Gas of this quality was actually supplied in fourteen different districts.

At the 1876 meeting of the same Association, Mr. J. Desha Patton came forward with a paper dealing with the same subject.† He said his experience was principally with ordinary commercial benzine. By this we may understand a light distillate from the crude petroleum; but it may here be remarked that the Americans sometimes use the terms "oil," "naphtha," and "petroleum" in such an indefinite manner as to render it difficult for an outsider to be quite clear as to what is really meant. In ordinary practical working, the average make was 70 cubic feet of gas per gallon; and the quality was 70 candles. He had been able to make as much as 100 cubic feet per gallon, but only at the expense of the quality. About 70 cubic feet of 80-candle gas, or 80 feet of 70-candle, was what he considered to be the best results obtained from benzine. The quantity of fuel required to gasify a barrel of benzine was 7½ bushels of coke, which should, of course, be added to the cost of the material; and the retorts lasted about six months. The 70-candle gas was in every way as permanent under distribution as ordinary coal gas. The cost of labour was one-half that with coal gas; so that, with the benzine supplied at about 3d. per gallon, he considered that the 70-candle oil gas was nearly as cheap as ordinary coal gas, and when adopted in new works specially constructed for it, the cost would be less. But he need not point out that it would not pay to sell gas of this quality at the same price, because the consumer would put on smaller burners and the actual consumption would be very much less; and therefore he recommended that it should be used as an enricher to ordinary coal gas. Petroleum gas could not be made in the same retorts, and at the same time, as coal or other gas; and the various qualities of petroleum required different degrees and quantities of heat to secure the best results. He preferred to make low quality coal gas, and use it as a diluent for the petroleum gas; and he regarded poor coal gas as a much better diluent than water gas, air, &c. Results were quoted in proof of the assertion that 8 or 10 per cent. of petroleum gas mixed with a poor gas made from cheap coal, yielding a 17-candle gas, were cheaper than a 15-candle gas prepared from a good quality gas coal without enrichment. The coal should be worked for quantity regardless of quality, as the gas could easily be brought up to the proper standard of illuminating power. A ton of inferior coal together with 16 gallons of petroleum would yield 13,000 cubic feet of 16-candle gas; or, one ton of coal and 32 gallons of oil would give 14,000 feet of 20-candle gas; or, one ton of coal and 42 gallons of oil would give 15,000 feet of 20-candle gas.

A report specially prepared by the Gas Commissioners at Boston, U.S.A.,* sets forth that the gas producing capabilities of petroleum are 60 to 80 cubic feet of gas per gallon, and its quality 50 to 70 candles. Some experiments were tried at the Boston Gas-Works, by running crude petroleum into one of the retorts of an experimental coal gas apparatus. Various quantities, ranging from about 15 to 80 gallons, were used in each experiment, but usually 40 to 50 gallons; and the yield of gas showed very considerable fluctuation, being generally between 70 and 80, but sometimes as low as 50 cubic feet per gallon. The average yield of thirteen experiments was 72·7 cubic feet per gallon. The illuminating value of a sample of gas from an 80 cubic feet per gallon yield, was 37 candles with the Argand, and 45 candles with a flat-flame burner. A sample from a 65 cubic feet per gallon yield was only a few candles better in quality. It is claimed that the make per mouthpiece per day is double that obtainable with coal, and the labour less than one-half. The gas is cheaper than coal gas, light for light; but on account of several reasons, which need not be noticed here, it would not be practicable to substitute a 60 or 70 candle petroleum gas for ordinary 16-candle coal gas. The plan of diluting the petroleum gas to something like ordinary qualities is condemned as extravagant, and also as yielding a gas of high specific gravity, that requires a high distributing pressure and is extinguished by very slight draughts of air at the burner. On account of the active agency of the air as depreciating the illuminating power, great difficulty arises in maintaining the regular quality, as a very slight variation in the proportion of air makes a noticeable difference in the gas. In addition to this objection there is the fact that the mixture will not remain homogeneous, so that sometimes it burns with a smoky flame on account of excess of hydrocarbons, and at other times dwindles, or perhaps goes out altogether by reason of excess of air. A gas consisting of a mixture of air, petroleum, and coal gas of poor quality, in such proportions as to have a specific gravity of 0·800, supplied by a particular company, is instanced as a case in point. Two objections raised against the use of petroleum are considered in the report. These are the difficulty of dealing with such an inflammable and volatile liquid, and the probable effect of a large increase in demand on the market price. As regards the first point, it is recommended to store the petroleum at a safe distance from buildings, in overhead tanks; so that the whole of the bottom is open for inspection and repair. The risk on account of the formation of explosive mixtures with the vapours and air is said to be almost *nil*. "It is almost impossible to mix naphtha vapour and air so as to form an explosive mixture, for the reason that when the proper proportion of oxygen is present, the mixture is so diluted by the inert nitrogen, that it cannot be ignited." This assertion is scarcely borne out by practical experience. On the second point, statistics are quoted to show that, although the demand for petroleum had increased rapidly during the last few years, the price had fallen. The lowest price had been reached, and it would probably remain steady at that figure, the number of wells in use being regulated according to the demand. The fact that there was practically an inexhaustible supply to fall back upon, would prevent anything like scarcity, with consequent rise in price.

THE SECRETARYSHIP OF THE GAS INSTITUTE.—By an advertisement which appears elsewhere in to-day's JOURNAL, our readers will see that the Council of The Gas Institute are about to appoint a Secretary.

INSTITUTION OF CIVIL ENGINEERS.—At the first ordinary meeting of the Institution for the present session, held on Tuesday last, the President (Sir J. Coode, K.C.M.G.) delivered his Inaugural Address, the subject of which was the British colonies as fields for the employment of civil engineers. The material for the address was furnished by the experience gained by the author during three lengthened professional visits to distant parts of the British Empire, involving journeys extending to upwards of 75,000 miles. The President alluded to the growth of the Institution from about 600 when he joined it in 1849 to approximately 6000 now.

THE LATE MR. JOSEPH GORDON.—An inquiry into the circumstances attending the death of Mr. Joseph Gordon, the Chief Engineer of the London County Council, which took place on the 9th inst., as recorded in the JOURNAL last week, was held by Dr. G. Danford Thomas on the following Monday, when the medical evidence adduced left no doubt that the sudden removal of the deceased gentleman was due to syncope resulting from a weak heart. A verdict to this effect was accordingly returned. The sad event, which has deprived the County Council of another of their chief officers, was alluded to by the Chairman (Lord Rosebery) at the meeting last Tuesday. He remarked that from the commencement of Mr. Gordon's connection with them, they were impressed with confidence in his ability. A vote of condolence with the members of the deceased's family was passed; and it was referred to the Standing Committee to take steps for filling up the vacant appointment, and to consider whether, in view of the conditions under which Mr. Gordon accepted office, it would be possible to make some pecuniary compensation to his immediate relatives.

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* See JOURNAL, Vol. XXIV., p. 830. † *Ibid.*, Vol. XXVII., p. 17.

* See JOURNAL, Vol. XXIX., p. 316.

Technical Record.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

A General Meeting of this Association was held last Thursday, in the Whitehall Rooms of the Hôtel Métropole. The PRESIDENT (Mr. John Somerville, of the Bankside works of the South Metropolitan Gas Company) occupied the chair; and there was a fair muster of members and friends.

MINUTES OF LAST MEETING.

The SECRETARY (Mr. Jas. W. Helps, of Croydon) presented the minutes of the meeting held at Ramsgate in May last; and it was decided, on his suggestion, to take them as read.

A VOTE OF SYMPATHY.

The PRESIDENT said that since their previous meeting, one of their members had been removed by death. He alluded to Mr. Wood, of Hastings, who was one of the founders of the Association. Mr. Chapman, who had known him for many years, would propose a resolution on the subject.

Mr. J. L. CHAPMAN (Harrow) observed that it was with great regret that the Committee heard of the decease of their old friend, Mr. Wood. Those members who joined the Association at its commencement, would remember the vast interest he displayed in promoting its success. For two or three consecutive years, he took the chair at the meetings; and he had done all he could to help to carry on the work when the Association was much smaller than now. It was with sorrow, yet with great cordiality, that he had to propose—"That the members of the Southern District Association of Gas Engineers and Managers, at their first meeting after the decease of their Honorary Treasurer and first President, desire to offer to the relatives of the late Mr. Alfred H. Wood their sincere sympathy in the loss they have sustained." He (Mr. Chapman) would ask the Secretary to kindly convey this expression of the sympathy of the members to the niece, who he believed was the surviving relative, with their best thanks for all the great benefits they had received from their deceased friend.

Mr. C. E. BOTLEY (Hastings) said he wished to second the resolution Mr. Chapman had proposed, as he happened to have succeeded Mr. Wood at Hastings. He had known that gentleman for a good many years; and could concientiously say that, since the inception of the Association, he had done a great deal towards bringing about their present success. He (Mr. Botley) was sure the resolution would be well received by the members.

On the suggestion of the President, the members signified their concurrence in the resolution by silently rising.

ELECTION OF OFFICE-BEARERS.

The PRESIDENT said the next business was to elect a President fer the ensuing year. The Committee had considered several names, and had had great pleasure in selecting a gentleman who, he was sure, would meet with a hearty reception from the members. He referred to their esteemed friend, Mr. T. May, of Richmond, whose name it was only necessary to mention to secure the approbation of those present. He moved that Mr. May be appointed to occupy the presidential chair.

Mr. C. GANDON (Sydenham) had pleasure in seconding the resolution. He had known Mr. May for some years; and he was certain he would make a worthy successor to Mr. Somerville.

The motion was unanimously carried.

Mr. MAY thanked the members for electing him to the honourable office of President. He should merely say that it would be his endeavour to promote the success of the Association; and he trusted that their choice would be well merited.

Mr. CHAPMAN next moved the re-appointment of the Honorary Secretary, and spoke in terms of praise of the manner in which he filled the position. He also proposed, as the former Treasurer had passed away, that the office of Treasurer should be combined with that of Honorary Secretary.

Mr. MAY seconded the motion, which was heartily agreed to.

The SECRETARY briefly acknowledged the kind way in which Mr. Chapman had alluded to his services, and the manner the motion had been received by the members, and he assured them that he would continue to do his best for the Association.

Mr. S. W. DURKIN (Southampton) next proposed that Mr. John Methven and Mr. Corbet Woodall be elected members of the Committee in the place of those retiring by rotation.

Mr. GANDON seconded the proposition, which was unanimously carried.

The SECRETARY moved a resolution, appointing as Auditors Mr. C. Farrand, of Balham, and Mr. E. Price, late of Hampton.

Mr. C. C. CARPENTER (Vauxhall) seconded the resolution, which was unanimously passed.

ELECTION OF NEW MEMBERS.

Mr. Henry Legg, of Herne Bay, and Mr. A. W. Ormston, of Plumstead, were next elected members of the Association.

The SECRETARY mentioned that he had received a letter from one of the late members of the Association, who was until recently the Secretary of the Midland Association of Gas Managers—Mr. W. R. Cooper, of Banbury. He wrote, expressing his regret that he was unable to accept the invitation to be present at the meeting that day, and finished up by saying: "I have often felt very sorry that I withdrew from you, for I remember with very much pleasure our little gatherings in the upstairs room at the Bedford Hotel; and if your Committee will kindly allow me, I shall have very much pleasure in again joining myself with you." He (the Secretary) did not think this was a matter which it was necessary to bring before the Committee; but the members would perhaps at once agree to the re-election as a member of Mr. Cooper.

The members acquiesced in this suggestion.

MR. METHVEN ON PHOTOMETRY.

Mr. J. METHVEN, of the Nine Elms station of The Gaslight and Coke Company, next read a paper on "Photometry." As time did not permit of the preparation of the whole of the diagrams and drawings necessary to illustrate the paper, we only give the first part of it this week (see p. 968), and in our next issue we purpose publishing the remaining portion. It was considered that, as the paper dealt with many important matters connected with the measurement of light, full justice would not be done to it unless the members had time to consider the various questions introduced. It was therefore resolved, after the President, Mr. Sugg, Mr. Frank Livesey, and Mr. C. Greville Williams had made some remarks (which will be reported next week), to adjourn the discussion to the meeting in February next.

This concluded the business on the *agenda;* and the members subsequently took tea together.

AMERICAN GASLIGHT ASSOCIATION.

[Abridged from the "Official Report" in the *American Gaslight Journal.*]

The Seventeenth Annual Meeting of this Association was held at Baltimore on the 16th and 17th ult., under the chairmanship of the President, Mr. A. B. Slater, of Providence, R.I.

A lengthy list of applicants for membership, comprising 25 active and 10 associate members, was approved. The Association now comprises 6 honorary, 363 active, and 15 associate members. The Council's report set forth, amongst other matters, that they had decided to print in advance the papers to be read at the meetings; and that a gold badge of membership, costing about £1 each, had been supplied to every member. The Council also recommended the appointment of an official stenographer, who should prepare a report of the proceedings. The Committee on Standard Unions, in furtherance of their labours, reported, that in addition to the sizes for 3, 5, and 10 light meters, announced at the last meeting, they had now fixed upon standard sizes for 20, 30, 45, 60, 80, and 100 light meters. They recommended that, from March 1 next, all meters ordered should be supplied with the standard connections, unless expressly stipulated. The report and recommendation were adopted. Mr. Emerson M'Millin, of St. Louis, was elected President for next year.

The President then delivered his Inaugural Address. He commenced by congratulating the members on the prosperous condition of the gas industry, notwithstanding increased competition; and insisted on the importance, if this was to be maintained, of attention not only to the introduction of the newest and most improved forms of plant and machinery, but also to the administration of the concern. "Officers or clerks whose position places them between the public and the company," he said, "should be persons of good address, of well-balanced minds, with ability to control their feelings, especially when the customer happens to be a person of the opposite nature." Gas companies should always take as much pains to please their customers as the retail tradesman takes to please his customers. They should pursue a liberal policy; avoiding such vexations as a charge for laying the service or fixing the meter. Their business was to sell gas; and the more they sold, the less they could afford to charge for it. The true policy, therefore, was to furnish a good quality of gas at a reasonable rate, and offer liberal inducements to consumers to use it; especially encouraging the use of gas engines, stoves, and regenerative burners. In some cases, for purposes of introduction, he would even give away a few stoves. They must not stop at increasing the sales; for a gas company who simply ran a service, fixed a meter, and then took no further interest in the consumer, did not do their whole duty. They must interest themselves in knowing that, as far as possible, the consumers burnt the gas properly and economically; and he thought any company who had more than 1000 or 2000 consumers could profitably employ for such work a man of good judgment, having the requisite knowledge concerning the proper use of gas, to secure the best results.

Referring to lighting by electricity, the President complimented the electric light people on their activity and business enterprise; but remarked that the report of the Massachusetts Gas and Electric Light Commissioners showed that some of the electric undertakings were not earning profits; as had also proved to be the case when the electric light was operated by the local gas company with, as was claimed, less expense than an independent company could do it. Millions of dollars had, he said, been invested in the electric light business; and it had extended with wonderful rapidity—reaching almost every city and large town in the country. But meanwhile the demand for gas had been increasing faster than it had ever increased before, and the suppliers of this illuminant might credit the electric light for at least a portion of the progress that had been made during the last seven or eight years. It had spurred them to increase the quality and reduce the price of their gas, to the introduction of improved apparatus, and to the invention of burners which utilized from three to four times the light for a given quantity of gas. In his opinion, electricity would never supersede gas; and the demand for gas would be enlarged and extended, particularly in the direction of its use for fuel. The combination of gas and electric light undertakings

might, in some places, be well for both interests; but he had yet to know of any satisfactory argument showing that in all cases it was going to be better for the gas companies. The gas business could maintain itself on its own inherent merits. The business of any gas company would be managed better, and would be more prosperous, if the manager devoted his whole time, attention, and energy to it; and just in proportion as his mind was diverted, whether by the electric light or by any other business, his gas interest must in some degree suffer from such neglect. He had observed that bad results had in some instances followed where gas companies had taken upon themselves the management of the electric light in addition to their own business. It might be true, in one sense, that a gas company could produce electric light at less cost than an independent company; but in another it might be at the expense of the gas interest. The electric light was not always a paying business at present; but electricity would have a share in the work of supplying artificial light. The field was broad, and the electric light would share it with gas.

With regard to fuel gas, the President thought that the consideration of producing a fuel gas that would do the same amount of work as coal, at the same or less cost, was more important than the nominal price per 1000 cubic feet. Although many attempts had been made, and circulars and advertisements issued, to lead one to think that success had been reached, the pioneers in this line had not been so successful as to be able to demonstrate that a fuel gas could be produced, distributed, and used for general purposes at a price the consumer could afford to pay for it, and at the same time earn a fair return on the investment necessary to carry on the business. He did not regard the fuel gas problem as an impossibility; but the active gas manager had little time to devote to its solution. Speaking of incandescent gas-burners—while admitting that they possess special merits, consuming but little gas, and producing a soft, mellow, and very steady flame—he thought that they lacked the elements necessary for the proper and thorough diffusion of light. Some were costly in the first place; while others required to be used with a chimney. The subject of the diffusion of light was worthy of attention from some of the younger members of the Association, who had advantages in the way of technical education which had not been enjoyed by the older ones. Many of them had been qualified to pursue investigations outside the old and well-beaten tracks; and he would remind them that the most successful work was acomplished, not by one whose knowledge was acquired from books only, but by him who was able, with experience in practical work, to bring to his aid that experience and the special knowledge which the books and technical schools furnished. With all the advantages of practical experience, thorough technical education and training, the several Gas Managers' Associations, and the weekly gas publications, something like the apparent competition of the electric light was needed as a spur to further activity. The same energy and scientific and business ability which had been exercised by their electric light friends during the past seven or eight years would, if concentrated upon the gas business, have shown even more marked results than the most sanguine could consider possible. Until within the last few years, the conditions were such that gas people had allowed themselves to drift into carelessness in management, into deep ruts of routine work, and into slothfulness from which it would take time to recover. The most successful gas managers would be those who were able to furnish a good quality of gas at as low a price as could be done by anyone under the same conditions and in the same locality. He did not advocate any wild or extravagant policy, but rather the exercise of calm and deliberate judgment, which should be combined with quick perception and comprehensive views of things.

In conclusion, the President dealt with the position of the American Gaslight Association in regard to the various District Associations. While recognizing the influence and usefulness of the latter, the American Gaslight Association must, he said, be regarded as representative of the country, and take the initiative in any work which is national in its nature and character.

(*To be continued.*)

THE death is announced of Mr. F. M. Roots, whose name is well known in connection with rotary exhausting and blowing appliances. Deceased was the son of a farmer, and was by profession a banker. He was in his 66th year.

WE are pleased to announce that Alderman Sir H. E. Knight, Chairman of the Southwark and Vauxhall Water Company, has nearly recovered from the effects of the serious accident he met with a short time since, on his homeward journey from America; and he is availing himself of the medium of the press to convey his thanks to his numerous friends for their inquiries and sympathy during his illness.

THE Western (U.S.A.) Gaslight Association have just sustained a loss by the death, at the early age of forty, of their President, Mr. E. J. King, Treasurer and Superintendent of the Jacksonville (Ill.) Gas Company, which occurred, as the result of an attack of typhoid fever, on the 28th ult. Mr. King had always been associated with the Jacksonville Company; his father (the late Mr. J. O. King) having been their Engineer. On this gentleman's death in 1887, the superintendence of the concern was taken by his son, who had been for some time his assistant. He was one of the organizers of the Western Association; and a valued member of the American Gaslight Association. Mr. King has left a widow and four children.

PHOTOMETRY.

By JOHN METHVEN, Assoc. M. Inst. C.E.

[A Paper read before the Southern District Association of Gas Engineers and Managers, Nov. 14.]

Photometry, as practised in the Metropolis under the "Instructions" of the Gas Referees, is a subject for a paper which requires no apology for its introduction. The Gas Referees are men of the highest scientific attainments; and therefore the work performed under their direction must meet with a considerable amount of attention, not only within the area of the Metropolis, which is the sphere of their operations, but throughout the country generally. During the past two or three years, the Gas Referees have made great alterations in the form of construction of photometers; and to such an extent have these alterations been introduced, that the manufacture of gas to suit the altered conditions is attended with alarming additional expense.

As I purpose reviewing generally the work of the Gas Referees, as an introduction of the subject of my paper, a reference to the Acts of Parliament which bear on the subject of their appointment will be necessary. By clause 29 of the City of London Gas Act, 1868, the Board of Trade are empowered to appoint "three competent and impartial persons, one at least of them having practical knowledge and experience in the manufacture and supply of gas;" and in case of a vacancy happening among them by death, resignation, or otherwise, shall appoint a competent and impartial person to fill the vacancy, one at least of the three being always qualified as aforesaid. By clause 31, it is provided "that two of the Gas Referees shall be a quorum, and at least two of the Referees shall concur in every act or determination of the Referees." Such, then, are the conditions under which the Referees are, or at least ought to be, appointed. One of the three, you will observe, must possess a practical knowledge of the manufacture and supply of gas, and of so much importance is this considered, that the qualification is again mentioned when an election is to be made to fill any vacancy. In the event of this qualification tending to bias the acts or determinations of the Referees, two shall form a quorum; so that it is quite possible for one of the three to be in the minority. Conflict of opinion was anticipated here. The allusion so pointedly made to one out of the three having practical knowledge in the manufacture and supply of gas, and the subsequent mention of the number to form a quorum, can have no other interpretation than that the Legislature intended both the Gas Companies and the public to be represented at their deliberations. The remarks I have to make on the recent work of the Gas Referees will, I think, show to what extent this interpretation of the Act is carried out.

Successive Acts of Parliament have repealed clauses of the 1868 Act bearing on the work of the Referees; and in clause 27 of The Gaslight and Coke Company's Act, 1876, the Referees are directed to prescribe and certify *the mode to be adopted* for testing and recording the illuminating power of the gas supplied by the Company, and the number and times of testing. In this same clause, reference is made to the pressure of the gas supplied; but this portion is repealed by The Gaslight and Coke and other Companies' Acts Amendment Act, 1880, to which we will refer directly. In the 31st clause of the 1876 Act, the Gas Referees have from time to time to prescribe *the mode to be adopted* for testing the purity of the gas supplied by the Company, and the number and times of testing such purity. Clause 32 states: "The gas supplied by the Company for public lighting shall, if required by either the local authority consuming, or the gas company supplying such gas, be supplied by measurement; and the Referees shall, if required by either, prescribe and certify *the mode* of ascertaining the quantity of gas consumed by the public lamps." Clause 34 states: "The Gas Referees shall from time to time prescribe and certify the situation, and number of the testing places, and the apparatus and materials therein for testing the illuminating power and purity of the gas to be provided by the Company." In The Gaslight and Coke and other Gas Companies' Acts Amendment Act, 1880, clause 6 states that the Gas Referees from time to time shall prescribe and certify *the mode* to be adopted for testing and recording the pressure at which gas is supplied by the Company; and the Gas Examiner shall in *the mode* so prescribed test the pressure.

You will observe the frequent repetition of the expression "to prescribe and certify *the mode*" (*a*) to be adopted for testing and recording the illuminating power of the gas; (*b*) to be adopted for testing and recording the purity of the gas; (*c*) of ascertaining the quantity of the gas consumed by the public lamps; (*d*) the situation and number of the testing stations and the apparatus, and materials therein for testing the illuminating power and purity of the gas; (*e*) to be adopted for testing and recording the pressure at which the gas is supplied by the company. The interpretation I put on this expression is that the Referees can direct or give instructions for the work to be done in a certain way, and the results recorded in a certain form, both in the matter of testing the illuminating power and purity of the gas, and in testing the pressure. The Act specifies distinctly that the illuminating power of the gas, when burning at the rate of 5 cubic feet per hour in the prescribed burner, shall, in the case of common gas, produce a light equal in intensity to the light produced by 16 candles. The Act further directs that the pressure shall be such as to balance a column of water of 6-10ths and 1 inch in height respectively at the different periods of the day; and power is given to the Referees to prescribe *the mode* of taking such pressure; but they have no power to alter the balance of the specified column of water, or the instrument for recording it.

The same interpretation will apply to the power of the Gas Referees for prescribing and recording the illuminating power of the gas; but I maintain it was not intended that they should exercise the power of altering the instrument for indicating the illuminating power of the gas. The Gas Referees have the power to prescribe the operation of testing the purity of the gas; and as this is a chemical analysis, there are more ways than one of accomplishing it, but it would be idle to suppose they have the power of altering the meter to record anything but the true volume of gas operated upon. In like manner, they may prescribe *the mode* of arriving at the quantity of gas supplied to the public lamps; but they cannot alter the meter for registering the quantity. They may prescribe the situation and number of testing places, and the apparatus and materials for testing the illuminating power and purity of the gas; but, surely it was never intended that they should alter the form of construction of the photometers—the photometers which were in use at the time and before the passing of the Act, and the same photometers which indicated the superiority of the London Argand over the prescribed burner in use under the 1860 Act, and to which introduction the Companies agreed. It was the same photometers which gave them the indicated value of the new burner; and it is this photometer the Gas Referees are now altering. The photometers have done very well for years, but now they must be changed.

The Gas Referees have arrived at the determination (and evidently the one of their number who ought to take the Gas Companies' side is in the minority) that all photometers which were in existence at the passing of the Act shall be altered in construction, so that the results they now give of the indicated quality of the gas shall be lower than they have ever given before. The "Instructions" of the Referees state that the photometer shall be the improved form of Bunsen xhotometer, prescribed and certified by them. There is more than one improved Bunsen photometer which has recently been introduced by the Referees; and as a description of each would occupy too much time, I will therefore refer only to one with which I have had some experience. The open photometer which has been supplied to the Lambeth Road testing station is, I presume, one of the improved Bunsen photometers. The photometer used at the works was the open, or Letheby type. It is a modern instrument, and provided with plumb-lines for indicating the terminals, and a sliding-balance, actuated by a small rack and pinion, for adjusting the position of the candles. In this so-called improved Bunsen photometer, the results of the indicated illuminating power of the gas, taken for a period extending over six months, was 16·38 candles; whilst the Letheby photometer at the works made the same gas 17·12 candles. We have here a loss of 4·3 per cent. I was confident that it could not be that the gas had deteriorated to that extent in travelling between the works and the testing place; so I determined to have the Letheby at the works altered to the lines of the photometer at the testing-place. The only difference in the two instruments was found to be in the size of the chambers at each end (and in which the gas to be tested and the candles are consumed), and the arrangement of the screens between the disc-box, the burner, and the candles. The bulk of the difference in the results above quoted was found to be due to removing the end board a greater distance from the burner. In the works photometer the distance was only 7¾ inches; and it was fixed at right angles to the photometer bar. In the testing-place photometer, the distance was 21 inches from the burner; and the end board was formed triangular, with its apex in a line with the photometer-bar. In the one case the gas received the advantage of the reflected light from the end board, which, in the case of the other photometer, it did not. The fact of moving the board and altering its form dissipated the reflected light to a great extent; but, as the following experiments show, have not removed it entirely. Screens were interposed with various-sized apertures between the burner and the disc; and as the size of the aperture in the screen was enlarged, the indicated results from the photometer were increased.

End Board in Original Position.

No. 1 aperture,	6⅝ × 2 ins.;	indicated quality,	15·80	candles.
2 „	6⅝ × 3½	„	15·83	„
3 „	6⅝ × 4	„	15·91	„
4 „	6⅝ × 6	„	16·14	„
5 „	6⅝ × 8	„	16·33	„

As the experiments were taken on different occasions, they are not comparable; but yet the question of reflected light is settled.

End Board as on Altered Photometer.

No. 1 aperture,	3 × 1½ ins.;	indicated quality,	15·86	candles.
2 „	4 × 2	„	15·98	„
3 „	6 × 3	„	16·13	„
4 „	8 × 4	„	16·16	„
5 „	10 × 10	„	16·18	„

In this case, there is a small difference only in the indicated quality of the gas with a 6 in. by 3 in. aperture; and that from an aperture 10 in. by 10 in.. But in the former case, there is half a candle difference from apertures with less range in their size. We have here evidence of the effect of the alteration of a Letheby photometer, which, at the time of the passing of the Act, was an acknowledged instrument, possessing none of the so-called objections which have been attributed to the Evans or closed photometer. The alterations undoubtedly cause the photometer to return a lower value to the gas than it previously assigned to it. Before leaving this subject, there is a point worthy of notice. In the last experiments, the smallest aperture, although larger in superficies than the whole flame, did not result in such a high return as when the aperture was used 6 in. by 3 in. This, I believe, represents the amount of reflection obtained from the chimney of an Argand burner. With the smaller aperture, the bulk of the chimney was obscured from the disc; and as an inconsiderable increase of light was obtained from the larger apertures as they increased in size, I think I am correct in attributing this effect to the chimney.

There has also recently been introduced into one or more of the testing places an improved Bunsen photometer, called the Tower photometer. The chief design of this instrument appears to be in the fixing of the gas and candles in a box or large chimney, through which large volumes of air are caused to flow at a slow velocity, greater—as a matter of course, at the gas end than at the candle end of the instrument. The gas is thus tested in a manner totally different from the conditions under which it is consumed by the public. The returns of indicated value to the flame in this instrument must be less (for reasons I hope to prove presently) than from an instrument of the open or Letheby type.

The Gas Referees having thus succeeded in introducing two forms of photometers which give each of them returns lower than did the instruments in use when the Act was passed, are proceeding now to alter the Evans photometer—which is in use in the majority of the testing-places—so as to bring this instrument down to the level of the new ones. The result of all these sweeping alterations means a considerable blow aimed at the Gas Companies. The inconvenience and expense will not be realized until they are fully completed. Photometry, which in days past assigned to various descriptions of gas coal a certain value, now attributes to them a different value. This must be acknowledged a matter of serious inconvenience; and as it concerns a very wide range of interests, its result cannot with accuracy be determined. In fact, it is a question, if this determined action on the part of the Referees is to prevail, whether the Metropolitan Gas Companies will be able to procure coal of quality good enough to meet the demands made upon them.

In the design and construction of the new photometers, preference appears to be given to the 60-inch or Letheby bar; and the 100-inch bar is apparently on the verge of disappearance. By this change, I venture to say photometry is not simplified, nor is it placed on a more accurate footing. A diagram has been prepared

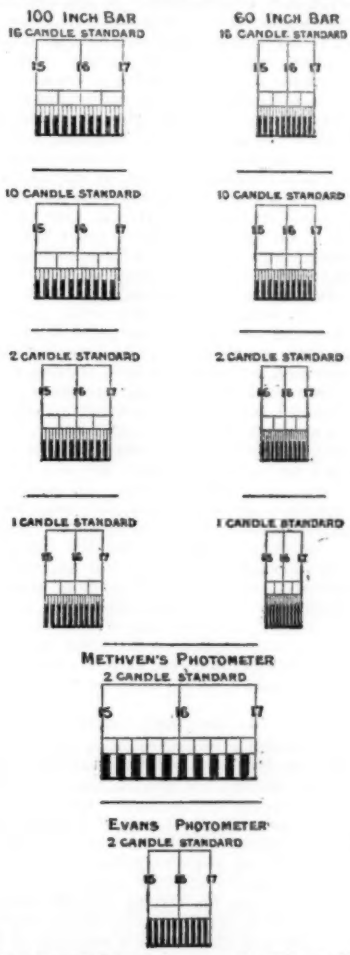


FIG. 1.—PHOTOMETER SCALES (ONE-THIRD SIZE) FOR PROPOSED STANDARDS OF LIGHT.

which indicates the difference of the scales on the two bars. The distance the disc has to travel on the two bars to obtain a range of 2 candles is very marked. On the 100-inch bar, the distance is approximately $\frac{1}{16}$ inch; whilst on the 60-inch bar, it is only $\frac{1}{10}$ inch. Such is the case when a two-candle standard is used, and

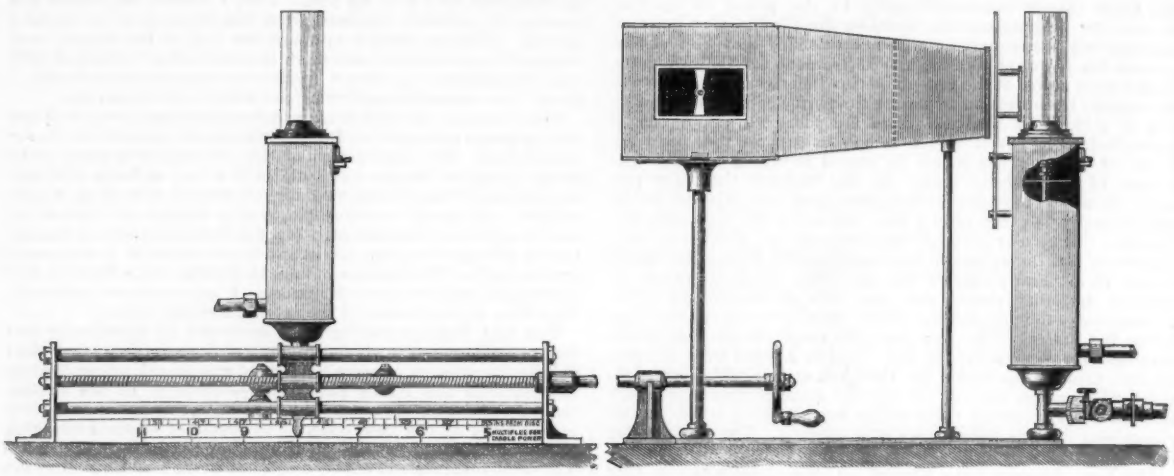


FIG. 2.—METHVEN'S PHOTOMETER (ONE-EIGHTH SCALE).

the gas to be tested is between 15 and 17 candle power. The distance to be travelled by the disc, when a standard of other power is used is shown on drawing No. 1. The following figures refer to some of the recently proposed standards:—

Distance the Disc is Moved to obtain a Range of Two Candles.

	100-inch Bar.	60-inch Bar.
16-candle standard	1⅝ in. ..	1 in.
10 „ „	1½ „ ..	1 „
1 „ „	1 „ ..	⅝ „

It will thus be seen what an exceedingly small range of travel a 60-inch bar presents, compared with a 100-inch bar. The personal equation difficulty is, of course, greater in the 60-inch than in the 100-inch bar. The difficulty of accurately balancing the disc on the 60-inch bar, with constant lights at the terminals of the photometer, and with the scale and index obscured from the operators' vision, is very great. I have repeatedly failed to obtain ten consecutive readings alike under these circumstances; and oftentimes the range above and below the mean has exceeded 0·1 candle on the scale. This variation, when multiplied by the power of the standard, is a serious reflection on the accuracy of the science of photometry. It is greater, of course, in its effect as the power of the standard is decreased, or the difference between the powers of the two lights is increased. With a view to reducing this obvious chance of error, I was induced some few years since to make a photometer (fig. 2) which I have the honour of submitting for your inspection to-day. The scale attached to this photometer is shown on the diagram; and compared with the 100-inch bar, the 60-inch bar, or the Evans photometer scale, possesses a much wider space to travel to obtain a range of 2 candles. With a two-candle standard, the distance to be traversed by the disc is 2¾ inches—a distance, I maintain, which reduces considerably, if not altogether removes, the errors due to personal equation.

The principle of the suggested photometer is, that the standard and the disc are at a fixed distance apart; and in the case of this photometer, both are stationary, and the light to be tested is moveable. When used for testing 16-candle gas, the lights are, as on the Letheby bar, 60 inches apart. If desired, the plate carrying the standard light and the disc may be mounted on flanged wheels, so as to move along a smooth board, and thus dispense with the necessity of moving the light to be tested. Many of the experiments made which will be referred to in this paper, were conducted with a photometer so arranged. All that is necessary is to remove the scale and substitute another, so as to indicate the movement and position of the combined disc and standard. The instrument thus constructed makes a very convenient portable photometer; and may be used for determining the power of any light fixed at any distance on the same horizontal plane.

The Standard Burner.

The standard burner for testing common gas shall be similar to that which has been deposited with the Warden of the Standards, in accordance with section 37 of The Gaslight and Coke Company's Act, 1876. This clause states that "the burner for testing common gas shall be a Sugg's 'London' Argand, such as immediately before the passing of this Act was the burner prescribed and used by the Referees, in pursuance of the City of London Gas Act, 1868." Clause 43 of this Act states: "The Gas Referees shall prescribe the burner for testing the illuminating power of the gas; and it shall be such as shall be the most suitable for obtaining from the gas the greatest amount of light, and be practicable for use by the consumer." Such were the directions for the Gas Referees in prescribing the standard burner. When this burner was presented to the public by the talented inventor and maker, Mr. Sugg, it possessed two chimneys—one 6 in. by 1⅜ in., and the other 6 in. by 1⅝ in.—for the purpose of adapting the instrument to the requirements of the 1868 Act, so that either might be used when necessary to develop the greatest amount of light from the gas. The Referees, in prescribing the burner to be used, have recognized the necessity of abolishing the smaller chimney, and have prescribed for use only the larger chimney. A series of observations which I have made on this subject, extending over some time, reveal the fact very decidedly that the burner supplied with the large chimney does not develop the greatest amount of light from the gas when burning at the statutory rate of 5 cubic feet per hour (see clause 25, 1876 Act). The following observations were made on the altered (or improved) Letheby photometer, which will account for the low recorded results in a great measure. The gas was tested by the usual method of rating the meter to 5 cubic feet per hour, and correcting the result for barometer and thermometer. Afterwards, the rate was increased so as to obtain readings equal to 16 candles; and then corrected for consumption of gas, barometer and thermometer. The followings figures represent the results:—

	Rate 5 Cub. Ft. per Hour.	Rate increased to obtain Readings of 16 Candles.
No. 1 . .	15·52	15·76
„ 2 . .	15·42	15·68
„ 3 . .	15·39	15·81
„ 4 . .	15·02	15·47
Mean .	15·34	15·68

Nos. 1, 2, 3, 4 each represent the mean results of observations taken on ten different days, and of course, under different atmospheric conditions. The average of the whole of the results shows an increase in the development of light when the rate of consumption was increased by $\frac{34}{100}$ candle. It is, I think, therefore clearly proved that the prescribed burner does not, with its prescribed chimney (6 in. by 1⅞ in.), develop the greatest light from the gas. Objection may be taken to these results, and my conclusions thereon, on the ground that the quality of the gas originally was not 16 candles, and that possibly different results would be obtained with a higher quality of gas. I am, however, prepared to meet these objections in the following manner. How are we to ascertain what is 16-candle gas now that the instrument for determining it has been altered? In the same manner as I have before shown where the alteration made in the photometers converted a 17·13-candle gas on the Letheby into a 16·38-candle gas on the improved Bunsen, so a 16-candle gas will be converted into a 15·31-candle gas. It is clear therefore that, when we talk about 16-candle gas, we must ask by what instrument is it to be indicated.

The observations to which I have referred are a practical means of arriving at the same results which were obtained by Dr. Pole many years ago—who found that the light yielded by any gas from any burner varied in the ratio of the quantity of gas burnt, *minus* a constant or subtractive quantity. Although in my observations the rate for the different qualities of gas was in the first place a constant one, yet the proportion of the illuminating constituents varied, with the result that the length of flame within the chimney was less. The flame consequently required less air for its combustion; and the principle of the burner being such that, as the length of the flame is reduced, so the quantity of air inducted by the chimney to the flame increases, it follows that the lower the quality of the gas, the more air is brought to exert its influence upon it. It has more than it requires; and the surplus only robs the flame of its energy, with the result of a considerable reduction in the development of its illuminating power. It is in this way, therefore, that the standard burner does not at all times—depending upon the atmospheric conditions—develop the highest illuminating results from the gas. Changes in the condition of the atmosphere cause corresponding changes in the condition of the gas. The density of the one follows the other. As is the density of the gas, so is the density of the flame within the burner. It does not follow that under a high barometer and a low thermometer, because there is more than the actual 5 cubic feet, at which the meter is rated, passing the meter to the burner, the flame should have a corresponding increase of length. In fact the contrary takes place—the density of the flame is increased, and burning

within the chimney in an atmosphere of equally increased density, combustion takes place nearer the burner and the flame is shorter. Under a low barometer and a high thermometer the density of the flame is lowered, which being burnt in an atmosphere of equally lowered density, attenuates the flame within the chimney, and thus automatically reduces the power of the chimney for inducting air. The gas is therefore consumed with a diminished supply of oxygen with a result, too apparent to be overlooked, of the production of a brownish-coloured flame. It is from this cause that the correction for temperature and pressure operates so unevenly. With gas with a low density, when the volume is corrected the indicated illuminating power is greatly improved; but the correction of the volume of gas with a high density, does not to the same extent improve the indicated quality. The loss is absorbed by the manner in which the burner consumes the gas; and that is further evidence that the burner does not develop the full light of the gas at all times.

The power of the chimney of a burner is, like the chimney of a retort-stack, equal to a certain amount of work and no more. If there is too much flame within the glass chimney, the result is the same as putting too many furnaces on to the chimney of the retort-stack. If, on the contrary, there is not enough flame within the glass chimney, more air is inducted than necessary for the proper combustion of the gas, just the same as would occur if the retort-stack chimney had not furnaces enough. Extending the comparison a little farther, just as the power of a retort-stack chimney is in proportion to the difference of density of the air inside and outside, so it is with the glass chimney of a burner. A burner with a chimney consuming gas in a room with a very low temperature, will induct more air to the flame than it would do burning in a room with a high temperature. And depending on the length of the flame within the chimney, the development of light from the flame would be influenced. This action of the standard burner which I have endeavoured to explain, ought, by some system of correction, to be compensated for, now that open photometers are being introduced. In the Evans photometer the construction of the instrument favoured a more uniform temperature for the combustion of the gas. The startling difference in the indicated returns of the quality of the same gas which I append when tested under different temperatures, make it apparent how important a matter it is that the temperature of the testing-place shall be kept at something approaching a constant condition.

In February last the following experiment was made, which was corroborated by several on other occasions. By leaving the window of the testing place open all night, the temperature of the room and meter of the photometer was found to be at 39° the next morning. The illuminating power of the gas was found to be, under these conditions, on the improved Bunsen, 15·93 candles. The hot-water apparatus was then put in action; and by the afternoon of the same day, the temperature of the room and the meter was increased to 72° Fahr. The same gas, tested under the altered conditions of temperature, was indicated as being of 16·90-candle power, or an improved quality of nearly 1 candle. A similar improvement in the quality was returned by an Evans photometer, which was fixed in the same room and supplied by the same meter as the improved Bunsen photometer. The following are the results obtained:—

Temp. of Meter.	Open Photometer. Candles.	Closed Photometer. Candles.
39°	15·23 ..	16·42
72°	16·90 ..	17·46
Increase in returned value due to a rise of 33° Fahr. . . .	0·97 ..	1·01

In the above experiments, the readings of wet and dry bulb thermometers were taken in the testing room, from which we were able to calculate the amount of aqueous vapour the air in the room possessed. On the table I have represented, by coloured water in test glasses, the amount of water present in the volume of air inducted by the burner (which is coloured red) under the different conditions of temperature. This, with the smaller quantity (coloured yellow) conveyed to the flame by the gas, is a practical illustration of the amount of water the flame has to contend with every hour it is alight. The reduced quantity at the lower temperature is very marked. The actual effect produced on the development of light from the flames of both the burner and the candles, I hope presently to refer to.

The size of the testing room has a great deal to do with the maintenance of a constant temperature. If this is desired, the room must be large and especially lofty, provided with moderate ventilation (ventilation may be carried too far). The official testing place situated at Lambeth Road has such an abundant supply of external air, that the apparatus might almost as well be outside in the open. Under these circumstances, it is a matter of impossibility to exclude fog. An atmosphere laden with fog is a very undesirable one for photometry. With a small operating-room, ventilation is necessary beyond doubt; but in a large room external air-inlets may and should be dispensed with. The gas would then be tested under conditions nearer approaching those under which it is consumed by the public.

The results of the returned illuminating power of the same gas under a change of temperature, would naturally lead us to inquire what is the correct temperature to use. Thermostats have been introduced lately into some of the testing places, with the view of maintaining a regular temperature; but these are in the habit sometimes of shutting off the supply of gas to the hot-water boiler, with the result that, a cold night intervening, the temperature of the apparatus is reduced, and the next operation of testing is made under circumstances unfavourable to the returned quality of the gas.

These results due to change of temperature induced me to make some experiments to discover the actual cause of the difference of illuminating value of the same gas. For that purpose, I used a standard light of carburetted gas supplied with a constant volume of previously dried air. To arrange this, I had the air-holder removed from the photometer-room into a larger room, where it would be unaffected by the change of temperature made in the testing room; and I thus made a standard of comparison which was constant in power. The results of the experiment fully corroborated my previous experiments; and showed that *the burner developed the highest illuminating value of the gas at the low temperature.* It was therefore clear to my mind that the increase of temperature did not in the end contribute to the higher returned value assigned to the gas, by improving the development of light in the burner. Its influence must have been exerted on the combustion of the candles in diminishing their light-giving value. If it was not from the fact before alluded to—that the density of the gas under the higher temperature was lowered, and a consequent advantage obtained from the correction—the difference would have appeared greater. I append the figures of one of the experiments, which in this case also was corroborated by others.

Temp. of Meter.	Results by Candles. Open Photometer.	Results by Constant Dry Air Standard.
56 ..	16·32 ..	16·37
70½ ..	16·78 ..	16·00

In these experiments we observe, as in the others previously mentioned, an increase of illuminating power of the same gas when tried by candles under an increased temperature, amounting to about 2¾ per cent.; while the constant dry-air standard revealed a reduction of light value of 2¼ per cent. I have remarked that these results corroborate my previous experiments. Some few years since, I was surprised with the result obtained by the improvement of the light developed by the flame of an Argand burner by causing the air which the burner inducted to pass through channels surrounded by ice in a vessel, made air-tight round the chimney gallery of the burner. The air thus reduced in temperature increased the development of light 10½ per cent. This result was not expected by me at that early stage of my investigation, and at first I was doubtful of its accuracy; but the same results were obtained on repeating the experiments time after time. I was not long in discovering the cause of the increased power of the flame. It was due entirely to the fact of the removal of the aqueous vapour from the air by its reduction of temperature. This was very interesting to me at the time; for I found that lowering the temperature of the air supply to the flame produced an effect on the flame in the same direction that makers of regenerative burners were striving to obtain by directly opposite means.

A very interesting memoir of M. Brémond was published in the JOURNAL OF GAS LIGHTING,* on the influence of atmospheric rarefaction on the illuminating power of gas, in which he describes some experiments made at different altitudes over the line of the Northern Railway of Spain. The apparatus was fitted in a goods' van attached to a special train; and at the different elevations along the road, his experiments were made. The conclusions he arrived at are that, with the increased altitude, the loss of illuminating power increases; and this he contends is quite independent of the influence of barometrical pressure and temperature in diluting the bulk of the gas itself. The general expression in English units of M. Brémond's rule for determining the loss of illuminating power of coal gas, due to rarefaction of the air in consequence of altitude, irrespective of barometrical corrections, is as follows:—The illuminating power of the gas of any given quality diminishes by 0·742 per cent. for every 100 feet of altitude. Here we have another instance of the alteration of density of the air influencing the work of the burner in developing the light of the flame; and although in London we cannot obtain anything like the altitudes M. Brémond found, we have a range of (say) 400 feet, which means an effect produced on the gas of (say) 0·3 candle.

(To be continued.)

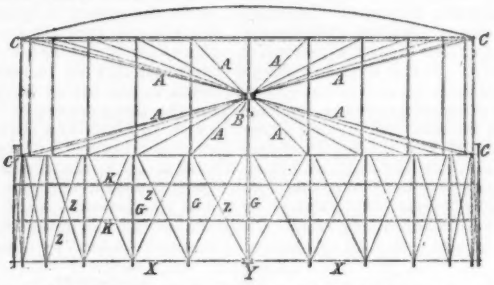
THE LABOUR QUESTION.—In a letter addressed to *The Times* last week, Mr. John Aird suggested that a Royal Commission should be appointed to consider and report upon the labour question. He thinks the difficulties now continually arising between employers and employed ought to be settled with greater ease, with some mutual confidence, and without that exhibition of ill-feeling unfortunately now existing. The evidence taken and the recommendations made by the Commisson, would be of great use when the question comes forward for consideration in Parliament; for he is of opinion that it will have to be dealt with, and at an early period of the ensuing session. The Royal Commission could consider the various suggestions that from time to time have been made for the appointment of arbitrators or courts of arbitration, inquiring also into the rules and constitution of the trades unions existing now in varied forms throughout the country, and collecting useful information to further the passage through Parliament of the Employers' Liability Act—a measure urgently needed, especially in the interest of the working class.

* See Vol. XXXVIII., p. 914.

Register of Patents.

GASHOLDER CONSTRUCTION.—Weck, F., of Birmingham. No. 17,538; Dec. 1, 1888. [6d.]

This invention relates to an arrangement for securing the curbs of gasholders in such a way that they shall always maintain their circular form and also their true position with regard to each other; and by constraining more especially the bottom curb to keep its true form and position. The object is to obtain greater certainty in computing the stresses to which the various parts of the structure are subjected; and the invention is especially applicable to holders whose external guide-framing is partly dispensed with.



In applying the invention in the case of single holders, or to the inner lift of telescopic holders, there are attached by one end to the top (and to the bottom) curbs a number of rods, whose other ends are fixed to one strong ring whose axis coincides with the axis of the holder, and which is situated at any point of the height of the holder—preferably at or near the middle. These rods are marked A. The ring is marked B. The top and bottom curbs of the holder are marked C. If it is desired to use trussing to support the roof, this can be done in the usual manner in conjunction with the rods attached to the top curb, which could be used also to act as main tension-rods by letting the king-post or centre strut rest upon the ring B.

The rods act in two ways. First they constrain the two curbs to keep their true circle; thus making them capable to act as compression members diametrically. Taking the vertical section through the centre of a holder, the curbs act as top and bottom members in the rectangle; the vertical stays being the vertical members. And here it is that the second function of the rods comes in, by keeping this quadrilateral figure always a rectangle, inasmuch as they act as diagonals.

In the other lifts of telescopic holders (not inner lifts) no such rods can be attached to the upper curbs or dips; and here they are only used to the lower curbs, being carried horizontally to the centre ring, as at X, the ring being marked Y. In this case the rods will act only in keeping the lower curb a true circle; and in order to keep the upper curb in its true position over the lower one, a series of diagonal ties Z is used in conjunction with the vertical stays or roller guides—thus forming the sides of the holder into a girder. The upper curb is kept to its true circle by the lower curb of the lift within it; and thus a rigid structure is obtained.

In order to keep the diagonal ties Z clear of the cup of the inner lift, it is proposed to carry them outside one or more supplementary curbs K if occasion requires it. Or where the sheeting is made to do duty for these ties, these supplementary curbs may be used to keep the sheeting in its proper shape; whilst without them the sheeting would, under conditions, tend to form a flat surface between the top of one vertical stay and the bottom of an adjoining one, and thus destroy the rigidity of the girder formed by the side of the holder.

UTILIZING THE WASTE HEAT OF GAS-ENGINES.—Davies, D., of Crumlin, near Newport, Mon. No. 18,516; Dec. 18, 1888. [11d.]

This invention relates to apparatus for utilizing the waste heat contained in the exhaust gases of gas-engines, whereby economy in fuel is said to be effected in the production of gas for such engines.

The patentee proposes to provide one or more continuous-acting heat regenerators, for intercepting the heat contained in the exhaust gases as it passes from the engine, and conducting a large percentage of it back again to the gas-producer. The ends or covers of the outer casing of the regenerators are by preference made of two pieces; each having a central half-round recess or opening to receive the necks of a bell-mouthed inlet and outlet for the exhaust gases. The disc or table of each bell-mouth is less in diameter than the inside of the casing, so as to allow air to freely pass around them; and the top side of the disc or table of the bottom bell-mouth is formed with a grooved recess, to receive a spigot on the underside of the horizontal heat intercepting trays. These are made to fit the inside of the casing, and are cast with a circular ring or spigot on the lower side, and with a corresponding larger recess on the upper side of the table, to receive the spigot of the next tray above it with its metallic, asbestos, oxide, or other cement joint. The holes in the tables are not opposite one another; and therefore the hot gases, as they pass upwards, communicate their heat to the heat-intercepting trays, against which they impinge. The heat given up by the gases is conveyed by conduction through the horizontal perforated tables and vertical spigots of the trays to the air chambers or spaces formed between the outside of the spigot and the inside of the wall of the outer casing. The cold air entering at the top surrounds the gases passing out from the central chambers through the top bell-mouth. It then flows through the perforated trays, and takes up from each successive outer chamber downwards the heat which the gases have parted with on their passage upwards through the central chambers; and when the air has arrived at the bottom chamber, it is at its highest temperature, and is drawn off therefrom by steam jet or other means, and forced into the gas-producer for making new gas. The regenerators are connected at one end by means of a branch-pipe having a central valve-chest fitted with a two-way valve, for the purpose of allowing the hot exhaust gases to pass into one end of the cold regenerator and to admit the cold air into the hot regenerator. The other ends of the regenerators are fitted with a corresponding duplicate valve-chest and valve, for the purpose of allowing the hot air to pass to the steam jet or injector, which draws it off and forces it into the gas-producer for making fresh gas, and also for allowing the cold gases to pass to the chimney. As these two valves are connected to one link, they can be reversed at certain intervals, for the purpose of reversing the direction of the currents of hot gases and cold air.

SERVICE CLEANSER.—Fiddes, W., and Stagg, W., of Bristol. No. 18,584 Dec. 19, 1888. [6d.]

This invention, which has for its object the construction of air force-pumps, especially adapted for the cleansing of gas-service pipes and fittings, in a more simple manner than those hitherto made for such purposes, was described and illustrated in the JOURNAL for July 2, p. 15.

GAS-MAKING APPARATUS.—Rock, J. W., Moore, C. G., Wood, J. H., and Nicolson, J. B., of Sydney, New South Wales. No. 10,700; July 2, 1889. [6d.]

This invention relates to improved apparatus in which the manufacture or making of water gas and carburetted water gas is carried on as a continuous operation—that is, while the apparatus is in operation, gas will be continuously flowing to the gasholder.

This apparatus is constructed with a cylindrical steam-boiler above three or more independent furnaces, which have above them (one for each furnace) three or more generating chambers or "generators," with connections (closable at will) to one smoke stack or chimney; and through each generator a carburetting or heating vessel or pipe passes. An independent valve is fixed to govern the operations of each generating chamber; and these chambers are so worked that the furnace of one or more are being blown up or heated while steam is being blown through the heated fuel of another so as to make water gas. The valves are provided with a bye-pass or escape to the open air during the regulation or change; so as to avoid any risk of explosion upon the sudden meeting of the currents of the different gases. In some cases, it is deemed advisable that the independent regulating-valves of each generator should be connected together, so that the manipulation of one handle would change the operation in each generator simultaneously; and in this case the manipulation might be carried out by some regular application of other power.

GAS-FIRES.—Main, R. B. and A. P., of Glasgow. No. 12,584; Aug. 9, 1889. [6d.]

This invention relates to gas-fires in which incandescence is produced by a Bunsen or other gas-flame playing upon a metallic fretwork or upon refractory balls or lumps held in position by such fretwork or upon both fretwork and balls. In one modification, the fretwork is formed with a number of projecting spikes to separate and hold in place the refractory balls or lumps, the back plate of the stove being dispensed with; or the balls or lumps may be held between the fretwork and the brick back by spikes or prongs formed on the latter or on a back plate. In a further modification, the use of the refractory balls or lumps is dispensed with, and two fretwork plates of metal or other material, and formed with projecting prongs or irregular perforated projecting cones or pyramids, are placed vertically over the burners, the contour of the irregular surfaces of the frets being such that the projections on one fit into cavities in the other; whilst only a narrow space is left between them, up which the gas-flame passes when impinging on the exposed surfaces of the metal, and heating them to incandescence.

APPLICATIONS FOR LETTERS PATENT.

17,461.—BICKERTON, H. N., "Improvements relating to prepayment meters for gas and other fluids." Nov. 4.

17,509.—BAKER, W. J., "Improvements in and relating to gas cooking-stoves." Nov. 4.

17,673.—THE COLTNESS IRON COMPANY, LIMITED, and YOUNG, W., "Improvements in treating gases from blast-furnaces, gas-producers, and coke-ovens, and in apparatus therefor." Nov. 6.

17,697.—IRVING, D., "Improvements in hydraulic gas-mains, and in valves connected therewith." Nov. 6.

17,713.—SLATTER, W., and WATKINS, W. J., "A double check gas and water regulator." Nov. 7.

17,810.—DINSMORE, J. H. R., "Improvements in and connected with the manufacture of illuminating gas." Nov. 8.

17,843.—CLARET, J. J., "Improvements in liquid-meters." Nov. 8.

17,855.—BULLOCK, E. and F. J., "Regulating the temperature of heat from gas, under the title of 'Bullock's gas heat regulator.'" Nov. 9.

17,857.—ROSE, G., "Improvements in lamps for burning gas or gas and oil." Nov. 9.

17,862.—WALLIS, W. H., "Improved method of preventing the escape of gas from chandeliers or other gas-fittings." Nov. 9.

DUKINFIELD LOCAL BOARD GAS SUPPLY.—At the last monthly meeting of the Dukinfield Local Board, it was resolved that the Finance Committee be requested to raise on loan the sum of £2500 for the use of the Gas Department.

WEST BROMWICH AND THE ELECTRIC LIGHT.—On the recommendation of the Gas Committee, the West Bromwich Corporation have agreed to apply to the Board of Trade for a Provisional Order to authorize them to provide and supply electricity for lighting and other purposes, at an estimated capital expenditure of £20,000.

THE BURSLEM TOWN COUNCIL OPPOSED TO ELECTRIC LIGHTING.—The Burslem Corporation have assumed an unfriendly attitude towards electric lighting. At their last monthly meeting, the Gas Committee recommended that the resolution they had passed to give notice to apply for a Provisional Order to authorize the Council to supply electricity, and appointing a deputation to confer with the local authorities on the subject of electric lighting, be rescinded, and that notice be given to the Board of Trade of the intention of the Council to oppose the grant of Orders to the Midland House-to-House Electricity Company, Limited, and the Municipal Electric Light and Power Company, Limited, or either of them, on the ground (1) of the large sum the borough has at stake in the gas-works; (2) of the absence of any demand for electric lighting at present; and (3) of the readiness of the Council to apply themselves for an Order to supply electricity as soon as the demand for it arises. The recommendation was agreed to.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE PROFIT-SHARING SCHEME OF THE SOUTH METROPOLITAN GAS COMPANY.

SIR,—Very nearly the whole of the men of all classes in constant work throughout the year, excepting a large proportion of the stokers, have accepted our profit-sharing proposal, and have signed contracts for a year's service. Amongst them are a number of Unionists and stokers; but the great body of the last-named are evidently kept back by the leaders of their Union. However, 911 agreements have been signed, which is about two-thirds of the total number of men employed in the summer, stokers included.

This hearty acceptance of the proposal by the men, coupled with its prompt and spontaneous approval by the public and the Press, is full justification for its having been made. It therefore now only remains to work out the details, which will be made as favourable as possible for the men; and with their hearty co-operation the Directors and officers of the Company will do all that lies in their power to render this profit-sharing system a real bond of union between labour and capital.

GEORGE LIVESEY.

South Metropolitan Gas Company, Nov. 18, 1889.

THE DANGERS OF ELECTRIC WIRES.

SIR,—It does not appear to me to be as certain that the people in London will have nothing to fear from the overhead and underground cables that will by-and-by be carrying their thousands of volts current for the purpose of electric lighting, as it seemed to the gentleman of the *Pall Mall Gazette* when he interviewed the Earl of Crawford the other day respecting the accidents from electric wires in New York City, if what another great authority has said be a fact. In your last issue you quote from the *North American Review*, in which Mr. Edison is reported to have stated, respecting the "danger of high-tension currents," that "there is no insulation which will confine these high tension currents for more than a limited period." Note the expression "limited period. And again he says: "The dangers of such circuits are not restricded to the wires which convey the high-tension currents; but other wires, conducting harmless currents, are liable to be rendered as deadly in effect as the former." Now, if we take the limited period, and the possibility of a harmless wire being rendered deadly by one charged with a high-tension current, as intimated by Mr. Edison, into the consideration of the New York accidents, we have an illustration of his statements at once, especially if we take the one in which a man and a horse were killed—the man not being the driver—the horse first, by coming into contact with a broken telephone wire, and then a man who took hold of the horse's bridle in order to help him up, supposing he had only slipped down. It being early morning and dark, the helper did not see the broken wire; and the driver was too dazed to give him warning of the deadly nature of the spot on which the horse lay. Consequently, the moment he touched a portion of the harness he was struck dead as by lightning. Well, all this mischief came about in consequence of the breaking and falling of a harmless telephone wire across an insulated wire, bear in mind, but which was conveying a 1000-volt current; and that portion of the telephone wire which reached the ground was taking, through the leaky insulation on which it was resting, a very powerful current to earth—a current certainly strong enough to destroy life. Now, this brings us to a question which ought to be answered without quibble: Was this a case of insulation which had passed its "limited period?" because if there be such a condition, the insulated cable which the noble Earl grasped so fearlessly the other day, with 2000 volts within, might become very deadly before long; and what then?

W. M.

Nov. 16, 1889.

THE CHEMISTRY OF ILLUMINATING GAS.

SIR,—In the JOURNAL for the 29th ult., Mr. N. H. Humphrys gives a method for producing gas from iron and steam, for which the equation is—

$$2\,Fe + 3\,H_2O = Fe_2O_3 + 3\,H_2.$$

This is quite correct. He then says: "According to this reaction, for every 3 lbs. of hydrogen produced, no less than 112 lbs. of iron would require to be oxidized." This statement is not correct, as the quantity of hydrogen obtainable from 112 lbs. of iron is 6 lbs., as shown by the equation. The bulk of 6 lbs. of hydrogen is about 1140 cubic feet; so that less than 1 cwt. of iron, instead of 1¾ cwt., would be required to produce 1000 cubic feet of hydrogen. But even with these quantities of materials, it is absurd to expect to get cheap gas by working on these lines.

H. KENDRICK.

Birmingham, Nov. 8, 1889.

ADDITIONAL WATER STORAGE FOR NEWPORT.—On the report of the Water Committee being brought forward for adoption at the annual meeting of the Newport Town Council last Saturday week, Alderman Lyne, Chairman of the Committee, stated that in a short time it was hoped to increase the storage area of their two reservoirs from 170 to 250 days' supply, and that this estimate was calculated on the high average of 20 gallons per head per day. With the expenditure of only about £4000, the borough would thus secure the additional 80 days' supply, and avoid for many years to come the necessity of going to Wentwood for additional water, at a probable outlay of £100,000. The report was adopted.

THE BIRKENHEAD CORPORATION AND ELECTRIC LIGHTING.—A special meeting of the Birkenhead Town Council was held last Wednesday to consider the subject of electric lighting, in view of the notices received from two companies of their intention to apply to the Board of Trade for powers to supply electricity within the borough. A report by the Town Clerk on the subject had been considered, and the Finance Committee now recommended that the Council should refuse their consent to the proposed applications, and themselves apply for an Order authorizing them to supply the electric light; and that the Mayor should call a special meeting to consider the question. Alderman Deaken moved the adoption of the Committee's recommendation. This was agreed to; and the Parliamentary Committee were authorized to take all necessary steps in the matter.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

WEDNESDAY, Nov. 13.

(*Before Mr. Justice* STIRLING.)

BRITISH WATER GAS SYNDICATE, LIMITED, *v.* NOTTINGHAM AND DERBY WATER GAS COMPANY, LIMITED.

This was a motion to restrain the defendants from holding a meeting for the purpose of passing resolutions for winding up the Company.

Mr. GRAHAM HASTINGS, Q.C., and Mr. SWINFEN EADY appeared in support of the motion; Sir H. DAVEY, Q.C., Mr. BUCKLEY, Q.C., and Mr. CHADWYCK HEALEY represented the defendants.

Mr. GRAHAM HASTINGS said the motion was brought to restrain the defendants, till judgment or further order, from passing resolutions to wind up their Company voluntarily until after the plaintiffs' claim to have an allotment of 10,200 shares therein had been satisfied. The case was shortly this: The voluntary liquidation proposed was obviously intended to defeat the claim made in an action, now pending, as to an agreement; and there being no other cause for the liquidation, he submitted that the defendants were not entitled to pass the resolution until the question at issue was decided. The dispute arose on an agreement dated April 26, 1889, made between the plaintiff Company of the first part, and Alfred Charles Dockerell, as trustee for the defendant Company, of the second part, and Mr. Cottam of the third part. It provided that Dockerell was to cause a Company to be registered, under the name of the "Nottingham and Derby Water Gas Company;" and that the plaintiff Company should grant and sell to the Company to be so formed the exclusive right to a licence of the patents for the counties of Nottingham and Derby. The consideration for such sales was to be the payment of £50,000 in cash, £50,000 in fully-paid ordinary shares, and £1000 by the allotment of 200 founders' shares. The purchase was to be completed within two months after the proposed Company proceeded to allotment; and the vendors were not required to guarantee the validity of the patents. On May 1, 1889, an agreement embodying the foregoing terms was entered into between the plaintiff and defendant Companies. The defendants eventually refused to perform the agreement; and on Aug. 14 last an action was commenced for specific performance thereof—the statement of claim being delivered on Oct. 24. As yet no defence had been put in; but it was not immaterial, having regard to the affidavits filed on behalf of the defendants, to see that on the 9th inst. a summons was taken out on behalf of the defendants, asking for an extension of two months in which to put in their defence. On Nov. 5 a circular was issued by the defendant Company, stating that they had been served with the writ in the action, and in consequence of the position of affairs, a petition for liquidation had been filed; and a meeting would be held on the 14th, when the matters would be laid before the shareholders. The capital of the Company was £150,000 in ordinary shares; and, as a majority of three-fourths was required before winding up could be resolved upon, it followed that if the shares were allotted to the plaintiff Company, no such resolution could be passed unless they consented. Upon receipt of the circular, the present proceedings were commenced, with a view of preventing the rights of the plaintiff Company being prejudiced. The learned Counsel then read affidavits filed on both sides—one by the Solicitor of the defendants to the effect that the patents were commercially valueless, and that they refused to perform the agreement upon the ground that the Directors had been induced to adopt it by material misrepresentations on the part of the promoters; another by Mr. Samson Fox, who denied that the patents were worthless, they having been worked at considerable profit at Leeds, and also that the promoters had made any misrepresentations, and alleged that the defendant Company had made no attempt to work the patents.

Sir H. DAVEY, on behalf of the defendants, described the motion as an experiment and a novelty. The Directors were in an awkward position. On the one hand they were being shot at by the plaintiffs; and, on the other hand, shareholders were threatening proceedings for the removal of their names from the register. The plaintiffs could not compel the defendants to work the patents; and yet they asked that the Company should be kept alive for two or three years while the action for specific performance was being tried. If the Company was wound up, the plaintiffs would not be prejudiced in any way, as they would get back their patents, which they alleged were so valuable.

Justice STIRLING: If the plaintiffs recover judgment in the specific performance action, they want to get shares in a going Company, not one that has been wound up.

Sir H. DAVEY: Whatever right the plaintiffs might have, either in respect of specific performance or damages, let them have it; but surely it was for the shareholders to decide whether or not the Company should continue.

Justice STIRLING asked whether there was any objection to the meeting being held on the 14th.

Mr. HASTINGS said he had not the slightest objection. The Chairman might state his views, and explain the position of matters as fully as he pleased to the shareholders; but he certainly objected to any resolution for winding up being passed.

Judgment was reserved till the following morning.

THURSDAY, Nov. 14.

Justice STIRLING, in giving judgment to-day, recapitulated the circumstances under which the application had been made to the Court, and said the only evidence filed in opposition to the motion was by the Solicitor to the defendant Company, who said he was advised and believed that the patents were commercially worthless; that the Company had been induced to adopt the agreement by misrepresentation; and that they had a good defence to the action for specific performance. He did not forget that the solitary defendant was really the Company; but he thought he must treat the defence as being in the hands of the three Directors, under whose guidance the Company had refused to carry out the agreement. They had issued a circular in which they stated that they were prepared to lay fully before the shareholders the whole matter; and under these circumstances, he regretted that they had not been a little fuller in their disclosures to the Court. In the absence of any materials on which he could form a judgment as to the matters raised by way of defence to the action, he confessed he was disposed to make such presumptions as he could against the Directors. The present application was based upon the ground that the plaintiffs were the owners in equity of one-third of the capital in the defendant Company, and, as such, were entitled to be present at the meeting, and to vote against the resolution; and, further, that the resolution, if passed in their absence, would seriously prejudice them, as they would receive shares in a Company in course of winding up, instead of in a going concern. It was to be observed that the defendants' Solicitor had not pledged his belief to the worthlessness of the patents or the alleged misrepresentation. In the absence of information which might have been given, his Lordship did not look very favourably on the case which was proposed to be set up in answer to the action for specific

performance; and though the present application was a novel one, if the matter had rested there, he should have been disposed to help the plaintiffs. But the matter did not rest there. The Court was asked to restrain, not the act of the Directors, but of the shareholders. It might be that two-thirds of the Company consisted of an independent body of shareholders who were prepared to exercise an independent judgment upon the questions submitted; and the question of whether or not the business should go on was one peculiarly for the shareholders to take into consideration. They might say, "Let the contract be performed as much as the Court sees fit to declare specific performance thereof; but having considered everything, we think the patents and inventions are not commercially valuable, and it is desirable the business should not be prosecuted." Supposing they came to such a resolution by a majority, would it be right for the Court to interfere, and say that the winding up should not go on? He was not persuaded that it would be right. The Court did not decree specific performance of agreements for partnership between persons who were unable to carry out agreements. If the state of things were such that the shareholders, *bonâ fide* exercising their judgment, came to the conclusion that the business should not be carried on, ought the Court to interfere, and bring about a deadlock? He did not think they ought so to interfere; nor did he believe that the plaintiffs would suffer any damage by such non-interference. It was highly probable that the proceedings at the meeting would throw more light upon the subject; and if a case should arise from the proceedings which would make it the duty of the Court to intervene, there would still be time to restrain the passing of the confirmatory resolution. The motion would be refused, but without prejudice to any further application which the plaintiffs might be advised to make. The costs would be costs in the cause.

SATURDAY, NOV. 16.

In re NOTTINGHAM AND DERBY WATER GAS COMPANY, LIMITED.

As the result of the proceedings at the meeting of the above-named Company reported in another column, a petition for winding up the concern was presented to the Court; but, on the application of Mr. Graham Hastings, Q.C., for the British Water Gas Syndicate, Limited, it was ordered to stand over for three weeks, as he wishes to cross-examine the Chairman of the Nottingham Company on his affidavit in support of the petition.

SULPHATE PLANT AT ARBROATH.—Sulphate plant of a capacity to deal with 20 tons of ammoniacal liquor per day will shortly be erected at the Arbroath Corporation Gas-Works by Messrs. R. and J. Dempster, of Newton Heath, Manchester.

VYRNWY PIPE-LINE LEAKAGES.—It was the intention of the Engineer of the Liverpool Corporation Water Committee (Mr. G. F. Deacon) to turn the water last week from Lake Vyrnwy into the pipe-line as far as Oswestry, in order to fill the large reservoir there, which has been completed, for the storeage of the water before it passes through the series of filtering-beds on its way to Liverpool. This, however, was prevented by the bursting of the pipes in two places, one above that part of the aqueduct which lies over the Dentyr, near the village of Llanrhaiadr, and the other on the section of the pipes running through Moilwrch, Bodlith, and Penllan. The consequences of these mishaps were not serious, as the pipes only contained surplus water; but they have raised a certain amount of alarm in the minds of the inhabitants of places on the line, who fear that when the water is turned into it from Lake Vyrnwy, the bursting of pipes may lead to mischief. As it is, the breakage of the pipe at Llanrhaiadr had the effect of washing a large quantity of earth into the valley. Should a leakage occur at the spot where the pipes have been laid along a high ridge above the village, the result will be a serious inundation, in consequence of the impetus which would be given to the water from the steep declivity.

PROPOSED ELECTRIC LIGHTING OF DUNEDIN (N.Z.).—At a recent meeting of the Dunedin Town Council, a letter was received from the representative of the Gülcher Electric Light and Power Company at Wellington, stating that he had just completed an installation of electric lighting in the streets and public buildings of that city, and suggesting that the Municipal Authority of Dunedin should consider the advisability of introducing the new illuminant in their district. He gave the following comparative figures for Wellington:—Gas: £1500 per annum; 230 lamps of 12-candle power—a total of 2760-candle power. Lighted from sunset to midnight (seven hours) for 22 nights per month; making about 1848 hours per annum. Electricity: £1750 per annum, and supplying water (motive power); 550 incandescent lamps of 20-candle power—a total of 11,000-candle power. Lighted from sunset to sunrise all through the year; making about 3700 hours per annum. He said it was difficult to name a definite price for an installation in Dunedin, without having information (1) as to the number and candle power of the lamps likely to be required; (2) as to the length of the streets likely to be lighted; and (3) if water would be available, or if steam power would be required to drive the machinery. But for a corporation in England an installation of 1000 lamps situated in buildings near the generating station cost about £3 per lamp, including the site for the station, chimney, building, steam-engine, shafting, dynamos, cables, and everything complete. He expressed his willingness to draft a scheme for the Council, should his suggestion be entertained. The communication was referred to the Gas Committee for report.

THE SHEFFIELD WATER SUPPLY AND LEAD-POISONING.—The question of lead-poisoning by the water supply was raised by Mr. Marsh at the meeting of the Sheffield Town Council last Saturday week. It appears that cases of lead-poisoning have been frequently treated at the local hospitals and by private practitioners, which could not be traced to the employment of the sufferers; and Mr. Marsh asked whether the Water Committee did not think it desirable to inquire into the matter, and report to the Council the number of cases due to the drinking of the Corporation water, with suggestions as to a remedy? In the absence of both the Chairman and Vice-Chairman of the Committee, Alderman Clegg replied that they had had the subject under consideration for some time. It was, he said, one of the most difficult problems they had to deal with as to whether the lead-poisoning arose from the water as it came from the reservoirs, or whether it was caused by something in the houses of the people. It should, however, be understood that the responsibility of the Corporation was confined to the water supplied in their own pipes; and it was supposed that the poisoning, if there was any, was caused by the action of the water upon the lead piping which ran from the mains into the houses, and which belonged to the landlords. The subject was mentioned at the last meeting of the Committee; and anything that could be done to ascertain what Mr. Marsh desired to know would be done. Since this meeting, the Water Committee have requested their Engineer (Mr. E. M. Eaton) to report to them as to the effect of the water supply upon lead at the present time, and as to the best means of treating the water with the view of counteracting any such effect that it may have.

Miscellaneous News.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary General Meeting of this Association was held last Tuesday, at the Cannon Street Hotel, E.C.—Sir JULIAN GOLDSMID, Bart., M.P., in the chair.

The SECRETARY (Mr. R. S. Gardiner) read the notice convening the meeting; and the seal was affixed to the register of shareholders. He afterwards read the following report:—

The present half-yearly ordinary general meeting of the proprietors has been convened in conformity with the Association's Acts of Parliament for the purpose of receiving a report from the Directors upon the affairs of the Company, and of declaring a dividend for the half year ended the 30th of June, 1889.

The following summary shows the results of the Association's operations during that period:—

	Cubic Feet.
The quantity of gas made in the half year ended the 30th of June last was	3,820,000,000
The quantity made in the corresponding period of 1888 was	3,673,000,000
Being an increase of	147,000,000

Or at the rate of 4 per cent.

The total number of lights on the 30th of June last amounted to 1,797,512; there being at that date 129,188 consumers on the books of the Association. At the close of the corresponding half year of 1888, the number of lights was 1,713,121, which gives an increase of 84,391, or at the rate of 5 per cent.

The entire length of mains laid on the 30th of June last was 1500 miles. The length of mains laid on the 30th of June, 1888, was 1439 miles; an increase of 61 miles.

These figures show that the business of the Company continues to extend, and the Directors are able to report an increase both in the gas-rental and in the profit for the half year under review, which were larger than in any previous period.

The cost of the coal employed during the half year remained about the same as in the corresponding period of 1888; whilst there was a distinct advance in the value of residual products—coke, tar, and ammoniacal liquor, all yielding an increased revenue.

The plant and mains at all the stations were maintained in a due state of efficiency; and the percentage of gas unaccounted for was still further reduced. The extensions recently undertaken on the Association's Gitschiner Strasse works at Berlin made good progress; and the enlargement of the Schoneberg Works, also at Berlin, was proceeded with. The work upon the new gasholder at the Association's Tabor works at Vienna advanced satisfactorily; and the extensions on the Association's works at Hanover are rapidly approaching completion. Some land required for further extensions has been purchased at Hanover and Vienna, and some land which, under present circumstances, the Association did not require, was sold at Aix-la-Chapelle and Vienna. A further portion of the Association's disused property at Toulouse and Rotterdam was also disposed of.

The Directors have to report that in consequence of the incorporation of the commune of Ehrenfeld with the town of Cologne, they have considered it advisable to accept an offer for their works and business at Ehrenfeld, made by the Municipality of Cologne, who have therefore purchased them on fair terms. The Directors have, on the other hand, to report the acquisition of the concession and gas-works for the lighting of the town of Saintes in the Department of Charente Inferieure, France.

They desire, in conclusion, to draw the attention of the proprietors to the accounts for the half year ended the 30th of June last. These have been duly audited, and from them the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme showing the profit of the Association for the half year and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—namely, a dividend of 5 per cent. and a bonus of 1 per cent. for the half year ended the 30th of June last, both payable free of income-tax on and after the 2nd of December next.

The CHAIRMAN: I have to move—"That the report which you have heard read be received and adopted." In doing so, I have also to make some observations. You will note that there has been a considerable increase of business during the half year under review—an increase which I think we anticipated, and for which we were entirely prepared; and I may say that I see no reason why, in the present state of the Continent, a reasonable increase should not continue. On the contrary, there are signs on the Continent, as well as in England, that business is prosperous; and if other business is prosperous generally, then the gas business is fairly prosperous too. The facts are very simple with regard to the half year. The coal, as you notice, shows a tendency to increase in price; but, of course, a gas company does not immediately feel the effect of an advance. That is a thing which is only experienced some time later; and I look forward to the time when we shall feel it. But we have, on the other hand, a moderate increase in the value of the residuals. I think I mentioned to you about a year ago that in my opinion—it was only my opinion, which might not have been justified—residuals had then fallen to their lowest point; and it has so happened that ever since then they have been more or less steadily rising. I did not know that my opinion would prove so prophetic. But it turns out that it was so; and all I can say is that I trust the present value of the residuals may be maintained, if not improved. To an English, as to a foreign, gas company the value of residuals is a most important thing; and among them there is none more important than coke. Therefore I am glad to say that some of the industries which use coke are improving; and consequently I do not see that there is any likelihood of a fall in residuals at the present time. The general improvement of great towns on the Continent is very remarkable. There is a tendency now-a-days for the towns to increase in population at the expense of the country; and it is a curious fact also that most of the great towns extend in the western, and not in the eastern portion. I heard only a few days ago of a town which was laid out with the intention that it should grow in the east; but it refused to do so, and increased largely upon the west. This is the general tendency of the population—it goes to towns and to the west of towns. To a gas company it makes no difference on which side the population is, so long as it is there. This point I notice is very true, especially with respect to Berlin, and also to Vienna, which have both increased and are increasing very rapidly. These, as you know, are two of our most valuable stations; and therefore it is important for us to notice this fact. Then the report refers to the sale of our business at the small town of Ehrenfeld, which practically was no longer so valuable to us as formerly, since we lost the city of Cologne some years previously, as you remember. At the time of the sale, our concession at Ehrenfeld was likely to expire in the course of a few years; and the town was expected to be incorporated with Cologne. Under all the circumstances of the case, and as the authorities made us a fair offer, we thought it advisable to sell. We had the opportunity of acquiring the concession and gas-works for the lighting of the small town of Saintes, and we made the purchase at a fair price. One small town, therefore, practically replaces the other in our books. I may say that, on the whole, our business is as prosperous as I have known it ever since I have been connected with it—that is for the last 21 years. That this is so is shown by a fact that comes home to the pockets of every one of us. We are going to do a thing which we have never done before with our present capital—give you a bonus beyond the 10 per cent. I want to say a few words upon this bonus, as I do not desire any proprietor in this Association to be misled or disappointed in any way. If we could give you a bonus every half year in the future, my colleagues and I would most readily do so; but we cannot lead you to

believe that we shall always give you a bonus. We may be able to do so every alternate half year, if the profits allow it; but this, of course, must depend upon the price of coal, and all those other considerations to which I have referred on previous occasions, and with respect to which I may say the same thing to-day. All I can tell you is that if you receive a bonus, you will have earned it thoroughly. Therefore, when you get it, you may be glad; but if you do not get it, you must not be disappointed. I think this is perfectly plain; and I am quite sure the shareholders who know my habit of telling them always what I think, will take the statement for what it is worth. That is the state of our affairs so far as the working of the past half year is concerned. It has been eminently prosperous, and we all feel the result. When I last addressed you, I advised the shareholders not to invest in water gas shares, though they were at a high premium (the premium was then 18), and though it was the fashion to do so at that particular period. If you followed my advice, you were wise; because if you want these shares to-day you can get them at somewhere about par, or at a slight discount; and if you did not invest in them you have saved your money. I expressed an opinion with respect to water gas premiums, and not with respect to all the uses of water gas; and as I have recently had an opportunity of hearing a great deal about what is done in America with water gas—having only just returned from America—I think it may be useful if I tell you the impression which has been formed on my mind as the result of that information. I give it to you for what it is worth; and as none of my colleagues know what I am going to say on this point, they are in no way responsible. I am myself responsible for what I say; and I can only give you the impression which I have formed, resulting from the information I received as to the progress of water gas in America. You must all remember that water gas is a non-illuminant—that is, in itself. It may be useful, for the purpose of a manufactory, for what may be called heating purposes; but it is of no use for lighting purposes unless you put something into it. In America, oil is very cheap; and therefore oils are mixed with water gas, with the result that gas which is a compound of water and oil is delivered in many parts of some cities, and entirely in others. It is also supplied in certain places in large combination with coal gas; while in other cases it is delivered in small quantities in combination with that gas. The result is this: Be it more dangerous or not, be it more injurious or not to the joints of pipes, I am not going to discuss; but the result goes to show that water gas is used in a great many towns in America, either by itself when mixed with oil as an illuminant, or mixed with coal gas for the purpose of increasing its illuminating power. Now, it is a curious state of things that you increase the illuminating power of coal gas by a gas which in itself is a non-illuminant; but that is the case, because it is owing to the admixture of oil which is a very powerful illuminant. The result of this is that very often when there is a failure in the quality of the gas, it is improved and increased in some parts of America by the admixture of what I call water and oil gas; and in some parts of America it also overcomes the difficulty which has occurred there, as well as here, with respect to labour. Now, I do not want to say a word about labour and the difficulties caused by strikes. I myself generally have a sort of tendency to sympathize with strikers, irrespective of the rights and wrongs of the case; and it is very often better that I do not know the rights and wrongs of the case. As I said, I have a sort of general sympathy with the workmen; and I like to see, more or less, a rise of wages, even though that may be at my own expense. But if strikes do take place, they seriously affect the locality in which they occur; and the result may sometimes be very wide-spreading. As water gas is made very easily by a small apparatus, and consequently an ordinary workman can produce it, it reduces the amount of skilled labour that is necessary; and in this sense it relieves the want of labour which occurs in a strike. It has consequently been used in several places to assist in the production of the gas that is required daily for the consumption of towns, in order to avoid the labour question. There is another point that I ought to mention to you, and which you must remember in discussing this subject; and that is that water gas has no secondary products. The consequence therefore, is that if you have a plant which only supplies water gas, you would have no residual products at all. As far as America is concerned, this is in many cases of comparatively little importance, because in looking over the accounts of some American gas companies I have been surprised at the poor results they obtain for their residuals. I have seen far less than 50 per cent. as the resulting value of the residuals; whereas, as you know, we have a very different story to tell in England and on the Continent. Therefore, from this point of view, it affects them less than it would an English or a European gas company. The substance of what I would say on this point is this: It strikes me that water gas is most useful, in the first place, where oils are very cheap; in the second place, where the residuals resulting from coal gas are also very cheap, and where, consequently, the diminution of the quantity is not material with respect to the sale. You will thus see that if I am asked my opinion as to how this affects English gas companies, I can immediately answer that I do not think it will be either of the same value or the same importance to them that it is to American gas companies, and for the reason that oils are dearer and residuals are higher—residuals from coal gas being of far greater value here than in America—and that coal is dearer in America than here. I have made these remarks, not that I believe that any particular patent for making water gas will be of the least use to anyone. All experience of water gas making (and it extends now over several years) comes to this—that there are various methods of producing it; one perhaps better than another; but no one so much better than the others as to make it worth while to pay a considerable sum for any patent. All the experience of the American makers is that they cannot make any very great difference in charge for their apparatus, because the difference in the apparatus itself is comparatively of less importance. The total result of the information I have obtained is that, in my opinion—and I know that some of the high authorities do not agree with me—the future of gas companies in England and on the Continent will not be seriously affected by the increased use of water gas as we see it on the other side of the Atlantic. That is the impression I have formed. I may be right or wrong; but it is the result of some inquiries and careful examination. I do not know that it is necessary that I should go into any other matter, except perhaps this—that sometimes we get new shareholders who ask me questions, thinking that we own freeholds in all our towns on the Continent, whereas the old shareholders know as well as I do that in many places we have, comparatively speaking, short concessions, and are obliged to meet the requirements (not always eminently reasonable) of authorities in all parts of the Continent, in order to obtain renewals of those concessions. But I venture to say that when you compare the price of gas on the Continent and in England with the price in America, the English and European companies gain very much by the comparison, because gas is very much cheaper in Europe; and that is one of the reasons also why water gas has been so largely introduced in America. I have mentioned this fact in order that you may see that, if we are cautious with respect to dividends and to statements I make from this chair from time to time at our meetings, it is because we like to be on the right and cautious side, and because we do not desire that any expectations should be entertained which will not be realized. When we look back to the progress this Association has made during the past ten or twenty years, I think we can only be satisfied with our success; and I believe it is owing, to a very great extent, to the desire we have always shown to meet all reasonable requirements, both of the public authorities and of the consumers, and in so doing we are best considering the interests of gas proprietors. I now beg to move the adoption of the report.

Mr. Wood, in seconding the motion, remarked that, with regard to all matters connected with water gas and such questions, it would be right in him not to express an opinion, because this was the first time he had heard the Chairman's views on the subject. He could say, however, that he knew a town in England where very good gas was supplied at 1s. 10d. per 1000 cubic feet without water gas.

Mr. Bradfield inquired how lighting by electricity affected the Association, and whether or not the Chairman had anything to say upon this matter.

Mr. Weir desired to know if the use of gas-stoves was increasing on the Continent.

Mr. Horncastle asked how many years the amortization of the capital for the Amsterdam works was likely to last, and to what amount it extended.

The Chairman: The amortization of the Amsterdam capital is provided during the term of the contract. Of course, we could not provide for it after the contract; nor is it necessary to do so before it would be over. With respect to gas-stoves, I may say that in many of our cities we have special canvassers recommending the use of gas-stoves. In most of our towns we have exhibitions—show-rooms they are called—where everything in the way of gas apparatus is displayed; and all that is possible is done to induce consumers to use them. If there is anything that has not been done by us which any ingenious gentleman can suggest, and which we think useful, we shall be most happy to adopt it. But I believe we adopt the very best methods of canvassing. If a new stove is invented here, we send it to our stations, in order that our foreign friends may see what the inventive genius of Englishmen has succeeded in accomplishing. With respect to electricity, I have nothing new to say. I have very often talked about it; and it is not necessary for me to repeat what I have said before. Electricity is taking a very great field in different parts of the world. There are towns in America which are lighted by electricity; and in Canada I have seen towns lighted by it which, if in England, could only boast of six or eight gas-lamps. From this point of view, there is an extensive use of electricity; but how far its progress will affect ordinary gas lighting I cannot now say, and it does not devolve upon me to do so. My desire is not to prophesy unless I am pretty certain. I was very successful the last time in prophesying; but I might not be so again. My friend would like to commit me; but I do not care to commit myself. You may depend upon it that we shall look after your interests, and try to defend them as far as we possibly can.

The motion was then put, and carried unanimously.

The Chairman next moved—"That a dividend of 5 per cent. and a bonus of 1 per cent. for the half year which ended on the 30th of June last be declared on the £3,800,000 stock of the Association; and that the same be payable, free of income-tax, on and after the 2nd of December."

Mr. Newton seconded the motion, and it was carried.

Mr. Weir proposed a vote of thanks to the Chairman and Directors for their continued able conduct of the business of the Association; remarking that he thought Sir Julian Goldsmid deserved their best thanks for the information he had given them in regard to water gas.

Dr. Haden seconded the motion, and it was carried unanimously.

The Chairman: I have often had the pleasure of saying that one of the reasons why we are so successful is that there is perfect unanimity between the Board and the shareholders. I have frequent visits from shareholders who come to the office and want to talk to me about different parts of the business; and I have never found any dissatisfaction expressed with our administration. Consequently, the confidence you have reposed in us is a great encouragement to us to do our best to promote your interests. I am satisfied that this Association stands in a sound position; and I trust it may continue to do so for many years. I am much obliged to you. Before we depart, I should like to move a resolution which is usual and not merely formal. It is a hearty vote of thanks to our officers, both at home and abroad, under their able chiefs, Messrs. Lindon, Leonard Drory, and Gardiner. You know that as our business increases, it adds to the labour of the staff, and the responsibility of the chiefs; and therefore I think you will agree with me that as we are well served we ought to be grateful, and give those gentlemen a hearty vote of thanks.

Mr. Wood seconded the motion, which was carried unanimously.

The proceedings then terminated.

SINGAPORE GAS COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held last Tuesday, at the Cannon Street Hotel, E.C.—Mr. R. S. Foreman in the chair.

The Secretary (Mr. Robert King) read the notice convening the meeting, and the Directors' report and the statement of accounts for the half year ending June 30 (which were alluded to in the Journal last week, p. 934) were as usual taken as read.

The Chairman said that from the statement made to the shareholders at the last general meeting, to the effect that the price of coal for the June half year would show a further advance, and with the remarks made under that head in the Directors' report, they would not be altogether unprepared to find that the cost during the past half year had reached the high average of £2 1s. 7d. per ton of coal carbonized, thus showing an increase of expenditure on coal account over the previous half year of £701, and of £1237 as compared with the corresponding six months of last year. This was the highest price they had paid for coal for many years past. In 1873 and the two subsequent years—taking the average of the three years—the cost of coal was rather higher. But then at that time the rate of exchange was very nearly at par, and they were getting from 4s. 3d. to 4s. 6d. per dollar upon all remittances from the East, and making their payments at Singapore at a very trifling loss from exchange; whereas for the past half year the rate of exchange had been the lowest on record, and they were only obtaining a fraction over 3s. per dollar upon the money remitted to England from Singapore. He might also remark that the payments at Singapore (which had of late been very heavy, by reason of higher freights) were made in sterling, at the current rate of exchange; and therefore were attended with the same loss as if the money had been transmitted to England. This was shown in the increased cost of coal. Nevertheless it was an actual loss on exchange; and if added to the item under that head in the accounts, the amount would be very considerably increased. During the last two months the rate of exchange had materially improved; and as there appeared to be a revival of trade setting in, and other causes might be operating to further the advance, they had some hope that it would be of permanent duration.

The cost of coal for the current half year, he regretted to say, would be high, but less than for the past six months. The old stocks of coal (purchased at a high price) were now exhausted; and they were beginning to use coal from their recent shipments, which had been laid down on the works upon much more favourable conditions. The Directors therefore trusted that the high cost of coal lately prevailing would prove only temporary and quite exceptional. With regard to the other departments of the business, he said that the gas and meter rental showed some improvement. Taking them separately, the private rental exhibited a slight decrease, from causes with which the shareholders were well acquainted—chiefly, the low cost of oil as compared with the higher price of gas. This was felt not only by companies in the East, but also, he believed, by home companies. The public lighting, however, was making very satisfactory progress. The sales of residuals had been well maintained; and the collections still continued very satisfactory. After these few general remarks, he would only detain the shareholders by a passing observation, expressing the sorrow of the Directors at the loss they had sustained by the death of their esteemed colleague, Mr. Arthur Clarke. He was well known to many of the shareholders; and he (the Chairman) was sure they would join with the Directors in feeling regret at his loss. Mr. H. W. Smith had been appointed to fill the vacancy on the Board. He was an old shareholder, and was well acquainted with all matters connected with the manufacture of gas; and he (the Chairman) believed that he would prove an acquisition to the Company. In conclusion, he moved—"That the report of the Directors, with the balance-sheet attached thereto, be received, adopted, and entered on the minutes."

Mr. Hill Dean made a few remarks concerning the reserve fund. He said he noticed it only now stood at £517. He urged upon the Directors the advisability of increasing the reserve rather than maintaining the present rate of dividend.

The Chairman said the reserve fund had been established about two years. If the high price of coal continued, it would no doubt be well to follow Mr. Hill Dean's suggestion. Inasmuch as the reserve fund was founded in a great measure for the equalization of dividends, and as the Directors regarded the present as an exceptional time, they thought it advisable to appropriate a portion of the fund for that purpose.

Mr. H. W. Smith, in seconding the motion, said he was pleased the Chairman had referred to the two special features of the accounts—viz., the cost of coal, and the loss on exchange, both of which items, as the shareholders were well aware, were unavoidable. The Company had of late been experiencing the worst time that could be found in the history of the concern, seeing that they had had to pay a high price for coal, and they had never had exchange against them to the same extent. As to what had been said by Mr. Hill Dean in regard to trenching upon the reserve in order to maintain the dividend, he (Mr. Smith) believed that they would in future be in a position to keep up the dividend without having recourse to the fund. From what he understood, freights and the rate of exchange were both improving. Some of the proprietors might consider that the Company was not making very rapid progress. But it must not be forgotten that they were only in the same position as the London suburban gas companies, many of whom were at a standstill; and he knew one or two that were actually showing a decline. That was a worse position than they were in at the present time, as they were making some advance. Although the private gas-rental had not increased, the fittings account and the residuals were showing a marked improvement compared with previous years.

The motion was unanimously carried.

The Chairman next proposed—"That a dividend be declared on the ordinary share capital of the Company at the rate of 7½ per cent. per annum, less income-tax, such dividend to become payable on and after Dec. 12."

Mr. F. A. M. Nicol seconded the motion, which was unanimously agreed to.

Mr. R. G. Rice moved a resolution, appointing Mr. C. Newton to the position of Auditor, vacated by Mr. Smith on his election to the Board.

Mr. Smith, in seconding the motion, spoke of the fitness of Mr. Newton to occupy the post, on account of his vast experience in similar capacities in connection with other companies.

Mr. Newton having suitably acknowledged his appointment,

Mr. Hill Dean proposed a vote of thanks to the Chairman and Directors for their attention to the affairs of the Company during the half year. He remarked that he became a small shareholder when the dividend was 5 per cent. Gradually it had come up to 7½ per cent.; and a great deal of this must be due to the carefulness of the Directors. He hoped they would keep in mind his suggestion as to the reserve fund.

Mr. Ries seconded the motion; and it was carried unanimously.

The Chairman, on behalf of himself and his colleagues, thanked the shareholders for this expression of their confidence. The Directors, he observed, had had considerable difficulties to contend with in the high price of coal, the low rate of exchange, and the competition of kerosene. They hoped in time to overcome these difficulties; and should it so happen that the accounts for the present half year were no better than those for the past six months, the Board would take into due consideration the suggestion as to a reduction of dividend.

A vote of thanks was next passed to the Engineer (Mr. W. T. Batten), the Secretary (Mr. R. King), and the staff, on the motion of the Chairman, who said that he could personally aver that the officers were indefatigable in their attention to the interests of the Company.

The Secretary briefly responded; and the proceedings terminated.

Hull Town Council and Electric Lighting.—No less than five companies have given notice that they purpose making application for Provisional Orders to empower them to supply electric lighting in Hull; but the Town Council resolved last Wednesday to oppose them, and to themselves seek for the necessary authority to produce and supply electricity for public and private purposes.

Extensions at the Castlemaine (Victoria) Gas-Works.—The necessity for increasing the plant at the Castlemaine Gas-Works has been for some time recognized by the Directors; and on Thursday, the 3rd ult., the completion of one section of the extensions decided upon was signalized by an assembly of shareholders at the works to witness the starting of new purifying appliances, supplied by Messrs. C. and W. Walker, and a new governor, supplied by Messrs. Braddock. These extensions will be followed by new manufacturing and storeage plant. The ceremony of formally starting the new apparatus was performed by Mr. G. W. Greenhill, the Chairman of the Company, who explained that, during the 30 years of the Company's existence, the appliances originally set up had become antiquated, and inadequate to meet the requirements of the improved business; and therefore an expenditure of about £2000 had been determined upon to bring them up to date. When all the contemplated changes have been carried out, the Company will be in a position to more than double their supply, while the gas will be of better quality. The extensions are being carried out under the advice of Mr. Monks, of Melbourne.

THE BRITISH WATER GAS SYNDICATE AND THE NOTTINGHAM AND DERBY COMPANY.

In the Journal last week we referred to some correspondence in a financial contemporary in regard to the difficulties which have arisen between the British Water Gas Syndicate, Limited, and the Nottingham and Derby Water Gas Company, Limited. Mr. Samson Fox replied to the observations made in the first of the letters quoted in our last issue; stating that after seven months of careful investigation and work, which had been carried on since the Syndicate was formed, his co-Directors and himself were more than ever convinced that the value of water gas, as claimed in the prospectus, had been more than verified. As one instance of this, he gave figures to show that in the water gas fired puddling furnace the consumption of fuel in the gaseous form per ton of production exhibits a saving of 55 per cent. over that used in the solid-fuel fired furnace, and the production per shift 290 per cent. greater. After referring to the action of the Nottingham and Derby Company, Mr. Fox stated that the Yorkshire Company, who at once secured their licences upon going to allotment, were now in a very promising condition, and had a good deal of valuable work in hand. He then pointed out that in a new industry of this kind, it takes some time to adapt any process, of whatever nature, to the various requirements of manufacturers. But the work of the staff was, he said, now bearing fruit in the shape of orders from some of the most important manufacturers in the country, not only through the Yorkshire Company, but from various districts where licences had not yet been granted by the British Syndicate. He therefore appealled to the shareholders of the Syndicate to be satisfied to give the business a fair chance, and not to be misled by action such as that taken by a certain section of the Nottingham Company. "A Disgusted Shareholder" followed with a letter, in which he called attention to the fact that Mr. Samson Fox had not answered the main points raised by the first correspondent. "How," he said, "can we believe in Mr. Fox's statement when we remember that, at the meeting of shareholders a few months ago, he told us that the Syndicate had, either in hand or secured by deposits, the sum of £1,650,000. We want to know what has become of the £1,650,000, or, at any rate, of the subscribed capital, and the money received for concessions. The Directors, in making the call, inform us that it is all gone, as they want money for pressing needs. As to the Yorkshire Company, will Mr. Samson Fox tell us candidly if the water gas is found to answer in the mill at Keighley, or whether it is true that it is condemned as a failure? Will he tell us, also, whether it is still in use at Baron Rothschild's works at Witkowitz, in Austria, for steel melting; and, if not, when and why it was discontinued? When we have this information, we shall be able better to form an opinion as to the worth of Mr. Fox's statements." Mr. Samson Fox, in reply, said his information with regard to the Witkowitz works was entirely at variance with that of the "Disgusted Shareholder;" and as to the Keigbley mill, water gas was being worked there with the greatest perfection for singeing yarns. As to the financial resources of the Syndicate, he thought the circular accompanying the first letter of call stated very fully the reason why the call had to be made—viz., in consequence of the non-payment by the Nottingham and Derby Company of their purchase-money, and of the agreement to defer the larger portion of the payment coming to them from the North British Syndicate. He concluded by stating that, as litigation was pending, his Board and he were scarcely at liberty to enter into further public correspondence, although they would be most happy to give all proper information privately to individual shareholders. The proceedings on the application for the motion to restrain the Nottingham and Derby Company from going into voluntary liquidation (which was refused) are reported in our "Legal Intelligence" to-day.

An Extraordinary General Meeting of the Nottingham and Derby Water Gas Company was held last Thursday, at the City Terminus Hotel, E.C.—Mr. Alderman Goldschmidt (of Nottingham) in the chair—for the purpose of considering a resolution for the winding up of the Company.

The Secretary having read the notice convening the meeting, which set forth its purpose,

The Chairman said the shareholders were, no doubt, aware that the parent Company (the British Water Gas Syndicate) had applied for an injunction against their passing a resolution such as that which had been read by the Secretary. Happily, the injunction had not been granted; and they were now in a position to proceed as shareholders to deal with that which properly belonged to them. He wished to call their attention to the statutory meeting which was held at Nottingham in July (*ante*, p. 222). At that meeting certain conditions were agreed upon between the parent Company and themselves—reducing the cash payment of the purchase-money from £50,000 to £30,000, and authorizing the creation of £50,000 of deferred shares, which were not to receive dividends until the original shares had received 50 per cent., or for five consecutive years 10 per cent. per annum. It was also agreed that this £50,000 should not rank against their Company in case it went into liquidation. The agreement was not ratified, because the parent Company wished these deferred shares to rank for dividend when a dividend was paid on the ordinary shares of 10 per cent. They further insisted that, in case of liquidation, the £50,000 should rank against the Company. The bearing of this, he thought, most of them, as business men, would clearly understand. Having said this much, he would go into the history of the concern, which must be of the greatest possible interest to them all. In the first place, he had to deal with what must be called a personal matter. When Mr. Cottam visited Nottingham to negotiate with Mr. Cox (his co-Director) and himself for this Company, and ask them to be Directors, he thought it very desirable that Mr. Cox and himself should possess shares in the parent Company, so as to have a hold over that undertaking; and he offered to sell Mr. Cox and himself each 200 shares in that Company at par, which shares, however, at the time, he must admit frankly, were quoted—officially or unofficially, he could not tell which—at a premium of 4½. They accepted these shares; but at a Board meeting held subsequently, he brought the matter before the Directors, and stated that whatever profit arose from them should be handed over to the Nottingham and Derby Water Gas Company if the shareholders wished it. They had sold these shares, because they did not desire to be shareholders in the parent Company and fetter their hands. They wanted to be left free to deal with the Nottingham and Derby Water Gas Company as independent members of its Board. When he entered the Company, he formed one of five Directors, two of whom—Mr. Kirk and Mr. Bellamy—were shareholders in the British Water Gas Syndicate. This would show the difficulty under which the Nottingham Directors had to work; because anything said adversely to the parent Company was naturally transmitted to it. He was bound to say that the gentlemen to whom he had referred proposed to retire from the Board; but they did not persist in it, and the other Directors did not wish them to retire. [Mr. Kirk dissented.] No doubt the shareholders were well aware that, by the terms of the agreement with the parent Company, they were to pay £50,000 in cash two months after allotment, and after the licences had been duly transferred to them. At a meeting held on May 16, without any notice at all,

Mr. Samson Fox and Mr. Cottam entered the Board-room and insisted on receiving £30,000 on account of the £50,000 which was due on July 1, in accordance with the agreement. The Directors flatly refused such a request, and said they would not part with any money until they had obtained the property in proper and legal form. Mr. Samson Fox brought his own Solicitor, who—to his honour be it said—told Mr. Fox that he had no right to ask for the money; and said that if the Directors paid it, they would pay it at their own private and personal risk. With such a demand before them, it was not surprising that they became rather dubious of the *bona fides* of the whole affair. They were given to understand, as Mr. Samson Fox had declared previously, that the parent Company had upwards of a million sterling at its disposal; and they thought people who were so wealthy, and who could deal with millions, need not ask them to advance £30,000. On May 17 he received a telegram from Mr. Cottam stating that the Yorkshire Company was prepared to buy £20,000 of the British Water Gas shares through the Stock Exchange, and asking if his Company would do likewise; adding that, as they were not going to manufacture, they would require little working capital. This would leave them £30,000, and give them £20,000 interest in the parent Company, which must have the effect of lifting their market, while at the same time giving the Nottingham Company a great interest in all companies through the British Syndicate. He further added that he believed the North British Company would do the same thing. He did not think, if he were to detain the shareholders for hours to explain the meaning of this telegram, that he could add one iota to the significance of it. He did not call a Board meeting, as he thought it was too contemptible a thing to deal with. On May 20 he received a telegram from Mr. Kirk, stating that a Director of the Yorkshire Company had put an order on the market for £10,000 of shares, which had raised them to par, and asking him what his Company were doing. He wrote to Mr. Kirk a letter, stating that he would not be a party to any stock transactions of any description; and pointing out that he joined the Company with the view of making it a commercial success, beyond which he had no other interest. Subsequently to that, the Secretary received a telegram, signed "One Interested," stating that every other Company, excepting theirs, was supporting their property with beneficial results, and theirs would suffer; further, that they deserved to go to the Devil—to be crushed out—and that they would be. Speaking for himself, he should be glad to be "crushed out" from the disagreeable position; but he and his colleagues thought it their duty to cling to the ship as long as they could, and not to allow the public to be imposed upon in any way whatever. On May 21 they received a telegram from Messrs. Samson Fox and Cottam with reference to a meeting at the Viaduct Hotel. This meeting he could not attend, and he believed it did not take place; but his colleague, Mr. Cox, had an interview with Mr. Samson Fox, and arranged for him to go to Nottingham for the purpose of inspecting a place where a plant could be erected for exhibition to the public. Mr. Samson Fox promised to visit Nottingham for this purpose; but he sent a telegram asking if they were prepared to pay them a large sum on account. They were not disposed to do so; and Mr. Fox did not go. They had been promised that a plant should be put down within six months (and that would have been within the agreement), so that they should know what water gas really meant before they paid any money away. On June 18 Mr. Fox visited Nottingham, where he promised that an engineer should be sent down to arrange about putting up plant. That engineer did not come until July 4; and this was the reason why the Directors were unable to take any action. After this experience, they became extremely suspicious, and thought it necessary to probe the matter to the core. From the evidence they had in their possession, they believed the patents were, even if valid—and they said they were not valid—of little or no value. They also believed that the statements made by the promoters as to the cost of the production, the past success of the process, and other points, were quite untrue; and they had now good cause for believing that the patents, or some of them, were known to the promoters to be invalid prior to the floating of the Company. These were strong terms to use; but he thought they would be able, when their case came on for trial, to substantiate everything he had told them, and if they spent every penny in law, it was better than paying anything to the parent Company. In conclusion, he moved—"That the Company be wound up voluntarily under the provisions of the Companies' Acts, 1862 and 1867;" or in the alternative, the Company to be wound up by the Court.

Mr. T. G. Cox seconded the resolution.

Mr. STREET said he thought the shareholders were bound to thank the Board for the manner in which they had acted; but he should like to know why, when they found that they were asked to spend money in buying the shares of other Companies, a further call should have been made. He proposed as an amendment—"That the Company be wound up by the Court."

The CHAIRMAN said he was afraid that if they wound up under the Court, another call would ensue. The money would have to be paid into Court; and it was now safely invested.

A DIRECTOR pointed out that it was competent, under a liquidation, to go to the Court; and he considered Mr. Street's suggestion would somewhat hamper the proceedings.

The CHAIRMAN thought they would go to work more vigorously by voluntarily winding up.

Mr. STREET said the Directors had his sympathy, for they had acted most honourably; but he wished to know whether it would not be possible to meet the parent Company in some way.

The CHAIRMAN said this was a matter which must be discussed afterwards. If Mr. Street's suggestion was accepted by the majority of the meeting, he must put it as a separate resolution.

Mr. HORNCASTLE could not agree with the Chairman as to his idea of the value of water gas. He held shares in several water gas companies, and had never sold one. He observed that rumours had been going about that the Directors were getting rid of their shares.

Several Directors declared that they held their original shares, and had not parted with any of them.

The CHAIRMAN said he had purchased some shares when they were at a low price, for the credit of the Company.

Mr. HORNCASTLE said he was sure the Directors would thank him for having given them the opportunity of making this explanation. He thought, however, the Directors had shown themselves to be incompetent, and ought to strengthen the Company by retiring and making way for a new Board.

Mr. CHESTER strongly supported the action of the Directors, but expressed the opinion that they should have looked into the matter more deeply at first.

Mr. M'CRAITH (a Director) thought the Board should not be charged with not exercising due discretion. They exercised as much discretion as possible when dealing with a thing which was somewhat novel and quite new.

After some further discussion, the motion for the voluntary winding up of the Company was agreed to, and Liquidators were appointed.

A vote of thanks to the Chairman closed the proceedings.

[Mr. Samson Fox has written to the papers in reference to the allegations made at the above meeting in regard to the disposal of their shares by the Directors; his explanation bearing also upon certain portions of the circular referred to below. He states that it is not true that he has recently sold, either directly or indirectly, a large number of, or any, shares in the British Water Gas Syndicate. As a matter of fact, he says he has neglected to sign, through pressure of business, a large block of transfers; hence the shares have not been registered in his name. This, he explains, is especially the case with no fewer than 3000 shares, a large proportion of which he purchased at premiums averaging 13s. Mr. Fox adds that his present holding in the Syndicate, apart from his vendors' shares, exceeds 4000 shares, on which he is about to pay the calls of £2 per share.]

A circular has been issued to the shareholders in the Syndicate by Mr. T. Brayshaw, of Settle, Yorkshire, in which he states as follows:—"Being a large holder myself, I have made repeated efforts, by personal application at the office, and by correspondence with the Chairman and Solicitors of the Company, to obtain information as to our present position and future prospects. But my efforts have been in vain; and the Directors decline to call a meeting at which the matter can be more fully explained to the shareholders. My complaint is this: That the shares of the Syndicate, which at one time stood at £20 premium, are now at £1 10s. discount; that little or nothing has been done to bring the invention practically before the public; that the Directors have, in spite of their promise not to make a further call, made a demand for the £2 per share at present unpaid; that in making the call no explanation is vouchsafed, and none can be obtained, as to the large sums named by Mr. Fox in his speech on the 14th of May, when he stated that, in addition to the amounts received from the sub-Companies, fixed concessions had been agreed upon to the amount of £201,000 (of which £150,000 was payable in cash), and other contracts entered into to the amount of over £1,000,000, on a large proportion of which Mr. Fox stated 'substantial deposits in cash have been paid to us;' that the validity of Mr. Fox's patents appears to be disputed by one of the sub-Companies; that Mr. Fox himself has shown his want of confidence in the business by parting with over 3200 of the shares held by him—only 290 now standing in his name. Under these circumstances, it is intended to compel the Directors, under the amended Article of Association No. 58, to convene an extraordinary general meeting, when the Directors will be asked to afford the shareholders more information as to the disposal of the large sums which have come into their possession, as to their apparent apathy, and as to the necessity for calling up the unpaid capital; further, to consider the position, financial and otherwise, of the above Company, and to pass any resolution that such meeting may think fit in regard thereto; to appoint a Committee of Investigation, who shall inquire into the position, financial and otherwise, of the Company, and report thereon to an adjourned meeting of that now required to be convened, or to a subsequent extraordinary general meeting of the Company—such Committee to have full access to all the books and papers of the Company, and such further powers as the meeting now required to be convened may delegate to them; to pass a resolution postponing the calls now made on the shares of the Company for such period as may be fixed by the meeting now required to be convened." Accompanying the circular is a form for signature; and Mr. Brayshaw expresses the hope that he will have the support of his fellow-shareholders in the movement he has initiated.

GAS WORKMEN AND THE LABOUR QUESTION.

In the JOURNAL for the 5th inst., we reported the initial stage in the movement on the part of the workmen employed by the Sheffield Gas Company for increased wages and shorter hours of labour. In the previous week the men had framed what they termed "a fair scale of work and wages;" and this was in due course submitted to the Directors in the form of a memorial. This was considered at the meeting of the Board on Monday last week, when it was decided to receive a deputation from the men, in order that they might have an opportunity of giving full expression to their views. A meeting was accordingly arranged for Wednesday, when the Chairman (Sir F. Mappin, Bart., M.P.), Sir H. Stephenson, and other Directors, the Law Clerk (Mr. W. Wake), the Manager (Mr. Hanbury Thomas), and the Engineer (Mr. Fletcher W. Stevenson) were in attendance in the Board-room. The deputation from the men were admitted, and were addressed by the Chairman in a very able speech, in which he reminded them that, in conducting the undertaking in which they were all engaged, the Directors had other interests to consider besides those of the workmen, and indicated what would be the effect of making the changes sought. However, he assured them that the Directors were desirous of meeting the men in a liberal spirit, and would regret if any difficulty arose between them. He then invited the members of the deputation to freely express their views; and this they did. The Chairman then reviewed the speeches; and the deputation retired to allow of a deliberation. On their re-admission, the Chairman submitted the following proposals for the men's acceptance:—Sunday time, from 6 a.m. to 10 p.m., to be paid to all classes of the workmen at the rate of time-and-a-half. Stokers' wages to be increased to 5s. 6d. per day, as asked for, but without the alteration of work. Firemen to work eight hours per day, and have 5s., wages as asked for, and to look after nine fires and clean six. Coal fillers to fill 16 loads in eight hours (or 11 loads at the new retort-house in Effingham Street), at 4s. 3d. per day. Coke wheelers to work eight hours per day, and receive 4s.; and purifiers to be advanced to 24s. per week, with time-and-a-quarter overtime. Boiler-men to be paid according to the work done, which would be arranged with each man specially, as the Company had a letter requesting them to do so. Fitters and smiths to be dealt with individually, according to merit, and receive time-and-a-quarter for overtime. The labourers' men on the coal-bank, street men, and labourers generally, to be advanced from 21s. to 22s., with time-and-a-quarter overtime; and fitters to receive time-and-a-quarter overtime and wages according to merit. Youths in the yard to be paid according to their abilities and merit. The question of contract work for coke, which had been raised in the discussion, would, the Chairman added, be considered and dealt with. It was rather a large question; but what the Directors had heard had not satisfied them that they were on the right tack. Sunday work should be abolished as far as practicable. Those were the terms the Board offered; and they did not think that they could go beyond them. Some conversation having taken place on certain points in the proposals, the chief spokesman of the deputation proposed a vote of thanks to the Chairman and Directors, and expressed a hope that a peaceful and right settlement would be arrived at. The Directors had, he said, acted as gentlemen ever since the memorial was sent in. The vote having been accorded, the Chairman, in answer to a question, said the new rate of wages would be paid the first week after an agreement was come to. The deputation then withdrew. In the evening a largely attended meeting of the men was held to receive the report of the deputa-

tion. The Directors' offers were submitted to the men and discussed; and although a disposition was manifested by some to stand out for the full concession of all the demands of the memorial, it was agreed by the majority to accept the offered terms. This decision was communicated to the Directors; and the advanced rate of wages, with the other arrangements as to hours, will come into force after next pay day.

The Directors of the Plymouth and Stonehouse Gas Company had a meeting last Thursday afternoon to receive the report of the Deputy-Chairman (Mr. R. H. Snow), the Secretary (Mr. J. Thomas), and the Engineer (Mr. J. T. Browning), who, as mentioned in the JOURNAL last week, were deputed to confer with the representatives of the men, who recently submitted certain demands as to hours and wages. The final conference with the men was held last Wednesday; and the terms then arrived at were practically confirmed the next day by the Directors. The new arrangements as to wages will come into operation from the 1st prox.; but the reduction of hours for labourers will take effect forthwith, and practically the entire staff of 200 men will do a week's work in 54 hours—the works being closed at one o'clock on Saturday afternoons. The following are the details of the changes which have been agreed on. The stokers and firemen are granted the eight-hour shift asked for. The six days' wages remain the same; but for Sunday work and overtime, they will be paid at the rate of time-and-a-half. The stokers in the original demand said: "We agree to draw and charge 72 retorts, as at present; but look after no fires." The Directors concede this, and will appoint fresh men as firemen; leaving the present men to do the carbonizing solely. The Directors agree that 54 hours shall constitute a week's work for general labourers in all branches. The men asked that all labourers should receive a small increase of pay—bringing up their wages to 3s. 4d. a day; but the Directors object to make this a general rule, and the men concede the point. The Directors will give or withhold an increase at their discretion. It was pointed out to the men that many of the labourers were aged men, who were not capable of earning their wages as compared with younger men, but whom the Directors would greatly regret to have to dismiss. The overtime regulation will be granted to the labourers as well as to the other classes of workmen. The sulphate men asked for 4d. per day advance. Their rate of wages will, however, remain practically as at present; but they will benefit by the overtime regulation. In the working of their department, there is a necessity for one hour's overtime each day, which, at time-and-a-half, will make an addition to their present weekly pay. The smith's shop men asked for 4d. per day advance; but this will not be conceded by the Directors as a general rule. The Directors have been desirous, in dealing with the labour question, to treat the men individually, according to their capabilities. The negotiations throughout were, we learn, carried on in an amicable spirit, and there was a desire between employers and employed to maintain the friendly relations which have existed hitherto.

The men in the service of the Derby Gas Company have memorialized the Directors on the subject of their work and wages; as have also those of the Walsall Corporation and the Colne and Nelson Local Boards. At Batley, the memorial recently presented by the men stood over for the consideration of the Council. On Monday last it was agreed to allow the men an advance of 6d. per shift, which is equal to an increase of 3s. 6d. per week. It was also decided to grant them double pay for Christmas Day and Good Friday. The eight-hour system has been in vogue at the Batley works for a considerable time. In various other places the demands of the men have been conceded.

We recorded last week (p. 935) the crisis in the dispute between the gas stokers at Bury and the Gas Committee of the Corporation—the town being in darkness on the night of the 10th inst., as the result of a strike on the previous evening. Last Wednesday, after interviews between the delegates of the gas stokers and the Committee, the strike ended; the Committee having practically conceded all the men's terms. The men demanded that, as the contract had been broken by the Committee, they should be paid for the time they had lost. The Committee did not agree to this, but consented to pay two days' wages to the men. Another point was that a number of the Corporation workmen who had refused to go on at the gas-works in place of the men on strike had been dismissed or were under notice; and the stokers asked that all these should be reinstated. The Committee said they could not deal with the work of other Committees. This was, however, afterwards conceded. The town was only partially lighted for three days.

It may not be out of place to reproduce here the following paragraph from the *Yorkshire Post*, giving an indication of the probable effect of the alterations just made in the Leeds gas workmen's wages:—The concessions which the Gas Committee of the Leeds Corporation have made to the men employed at their various works are likely to lead to a rather substantial charge upon the inhabitants. It is impossible to say to £1000 or so what the extra expenditure arising from the additions to the staff rendered necessary and the advanced wages of the existing *employés* will amount to; but it is anticipated that it will not fall far short of £12,000 a year. For some time before the recent dispute between the Committee and the men, the receipts in the Gas Department had been £5000 per annum less than the yearly outgo. The Committee, therefore, are now considering how they may best meet for the future a probable deficit of £17,000 or £18,000 annually. The only way of making up the deficiency which seems at all feasible is to increase the price charged to consumers for the gas supplied to them; and this course has, we understand, been virtually resolved upon. Many members of the Committee are said to be in favour of an advance large enough not only to cover the deficiency mentioned, but also to leave a surplus sufficient for all possible contingencies. The charge at present is 1s. 10d. per 1000 cubic feet. An addition of 1d. per 1000 feet would yield about £8000. A portion of the Committee are, it is rumoured, for adding 6d. per 1000 feet to the price, and thus of increasing the revenue of the department to the extent of no less than £48,000, assuming that the consumption did not decrease. The majority of the Committee, however, are, it is believed, in favour of an increase of 4d. per 1000 feet, which would produce £32,000.

THE KEIGHLEY TOWN COUNCIL AND ELECTRIC LIGHTING.—The Keighley Corporation having declined to support the applications of two electric lighting companies for Provisional Orders authorizing the supply of electricity in the borough, one of them has withdrawn its notice; and unless the other company follows the same course, the Gas Committee have obtained the consent of the Council to their making an application for similar powers.

BAHIA GAS COMPANY.—The report of the Directors of the Bahia Gas Company, Limited, for the half year ending June 30 last shows a balance of £9087 (which includes a profit on exchange of £3190), and with the balance brought forward makes a total of £9953. The Directors recommend the usual dividends on the preference shares, and a dividend at the rate of 8 per cent. per annum, free of income-tax, on the ordinary shares; leaving £3728 to be carried forward.

THE BURTON-UPON-TRENT CORPORATION AND ELECTRIC LIGHTING.

A Special Meeting of the Burton-upon-Trent Town Council was held on Monday last week—the MAYOR (Mr. C. Harrison) in the chair—to consider a report of the Gas Committee as to the introduction of electric lighting into the borough for public and private purposes.

The report stated that three Companies had given notice of their intention to apply to the Board of Trade for Provisional Orders to enable them to supply electricity within the borough; and the Committee considered that the time had come when a decision should be arrived at as to whether the electric light should be supplied by the Corporation or by a company. After due deliberation, the conclusion they had come to was that the Corporation should themselves undertake the work, and refuse their sanction to the Companies' application. A special report on the subject had been made by the Gas Manager (Mr. F. L. Ramsden), who had been in consultation with Mr. A. Siemens on the project. The latter gentleman had furnished estimates for two schemes—one for lighting the whole of the borough with 20,000 16-candle power incandescent lamps, and another for lighting the two principal streets with 2000 lamps of similar power. For the first, the cost of the complete installation would be £114,000; for the second, £11,600. The maintenance and working expenses for the smaller station, which Mr. Ramsden thought was all that it was necessary to consider, was given by Mr. Siemens as £3000; making the cost of each light £1 10s. per annum. In addition to this (which was the net cost of generating and distributing the electricity to the consumers for a 16-candle power lamp per lighting year of 2000 hours), there would, he said, be the additional expense of the renewal of the lamps. These were stated to last about 1000 hours; and the cost of them was 4s. each—bringing up the total to £1 18s. per light per annum. Mr. Ramsden's report concluded as follows:—"Comparing these figures with the price of gas, I find that one gas-burner lighted for 2000 hours, and consuming at the rate of 5 cubic feet of gas per hour, consumes 10,000 cubic feet of gas, which at 2s. per 1000 cubic feet (this sum being the net cost at Burton of production and distribution, including all working expenses and interest and repayments of loans), gives £1 against the above-named £1 18s. for the electric light. There is another item of expense which must also be taken into consideration—viz., the cost of introducing the electric light into the consumer's premises. This will have to be borne by them; and, according to Mr. Siemens's estimate, for the work to be done in an efficient manner will be—including inside wires, switches, safety fuses, and fittings—about £1 5s. per light. Though Mr. Siemens gives the net cost of the Board of Trade unit at 3d., he thinks—and I quite agree with him—that we should insert in our Draft Provisional Order the maximum price the Board are likely to allow, which in all probability will be 8d. I should state here that all the figures given, both as to the cost of installing and working the generating station, have been based upon the supposition that it would be erected at the gas-works. Both Mr. Siemens and I think that it is the most suitable position. There is plenty of available space; the fuel (coke) is at hand; and the staff and working expenses will be considerably less than if the station were erected elsewhere."

Alderman LOWE, in moving that the Corporation apply for electric lighting powers, as recommended by the Gas Committee, explained that at several of their meetings prior to the receipt of notices from the Companies, the matter had been discussed; and two months before the first notice was received, Mr. Ramsden was requested to report as to the best means of introducing the electric light into the borough. Thus it could not be said that the Committee had not been fully alive to the progress the light was making. By the recommendations of the Committee, it was suggested that the generating station should be at the gas-works, so that the latter and the new light could be made conjointly and economically. In the production of the electric light, coke was an important factor; and by the proposed arrangement, the latter material would be on the premises, and would therefore be supplied at a reasonable cost. By the Corporation retaining in their hands the power to supply both gas and electricity, the ratepayers would have the chance of two lights; and those who disliked gas could have the electric light by paying the extra cost. The Committee were asking the Council to pursue an intelligent policy, and one which had been adopted by the authorities of many of the principal towns in the kingdom. They advised that for the present the area to be lighted should be a limited one, as they wished to move cautiously.

The Committee's recommendations were agreed to.

MOSSLEY CORPORATION GAS SUPPLY.

THE HALF-YEAR'S BALANCE-SHEET.

At the Meeting of the Mossley Town Council last Thursday—the Mayor (Alderman R. S. Buckley) presiding—the report of Messrs. Aldred and Sons, the Auditors, on the accounts for the half year ending Sept. 29 was submitted. From this it appears that the make of gas during the six months was 20,279,400 cubic feet, and the consumption 15,053,600 cubic feet. Of the latter quantity 13,898,700 cubic feet were taken by private consumers, 945,800 cubic feet burnt in public lamps, and 209,100 cubic feet used on the works. The unaccounted-for gas was 5,225,800 cubic feet, or 25·77 per cent. of the total make; and the Auditors observe that, although the loss is less than in the corresponding halves of the two previous years (when it was 26·86 and 27·27 per cent. respectively), it is still exceptionally heavy, and requires careful attention. The amount charged for gas, inclusive of works and public lamps, was £2050 14s. in the last half year, against £2069 in the September half of 1888, £2077 in 1887, and £2189 in 1886. Although the amount is less than last year, owing to a reduction in the price, the consumption has increased from 14,331,600 to 15,053,600 cubic feet. The Auditors also call attention to the arrears of gas-rentals owing in September, the amount being £382 17s. 6d., against only £93 16s. 10d. twelve months ago; but they express satisfaction with a statement of the Gas Committee, that arrangements have been made for expediting the collection of rentals. During the half year a sum of £1000 was charged to the insurance fund, and the amount has been invested with the Heywood Corporation at 3½ per cent. The Committee decided to transfer £426 to the sinking fund account. The Mayor, commenting on the report, said he was surprised that the Auditors had made so much of the leakage. During the summer half year the consumption was less than 20 million cubic feet, while during the winter half it was as much as 55 millions. The mains had to be kept charged, whether the consumption was great or little; and the percentage of loss on the smaller was naturally greater than upon the larger quantity. The percentage for the whole year was less than that of the neighbouring town of Stalybridge, notwithstanding that they had 34 miles of mains in Mossley against only 22 in Stalybridge, and that their total consumption was only 77 millions, against 111 millions in Stalybridge. He added that the new sulphate plant was working very well indeed.

THE PRICE OF GAS COKE.—Gas Coke, following the example of ordinary blast-furnace coke, is selling very well for next year. We understand that some of the most important contracts for gas coke have been settled at about 13s. per ton, or not much less than double the price of the contracts entered into a year ago.

NEWCASTLE AND THE ELECTRIC LIGHT.

A Curious Legal Difficulty.

The Newcastle and District Electric Supply Company and the Newcastle Electric Lighting Company are faced by an unforeseen legal difficulty; and until it has been overcome, the Board of Trade will not give them permission to proceed. Both Companies have had their premises erected and the plant fitted up, and are prepared to go on at any moment with the laying of the cables. The trouble is a peculiar one, and has come about in this way—the two Companies, in the first instance, submitted their proposals to the Newcastle Corporation, who, after due consideration, approved of them. The plans were then sent to the Board of Trade, and were returned, with certain suggestions, that were adopted by the Companies and the Corporation. It was supposed that there was nothing in the way of an immediate beginning. But the Town Clerk, while studying the Acts of Parliament relating to electric lighting, discovered that, although there were certain penalties threatened if a company, after laying its mains, should neglect to repair the streets, yet there was no authority that had power to set the law in motion, and to initiate a prosecution. This curious predicament was communicated to the Board of Trade, who, finding the point puzzling to themselves, promised to submit it to the law officers of the Crown; and when the matter came to be considered, it was decided that the Electric Lighting Act made no mention of the point at all, and that it would probably be necessary to have further parliamentary powers concerning it. Last Tuesday, the Chairman of the Newcastle Electric Lighting Company (Mr. J. D. Milburn) addressed a letter to the Mayor, pointing out that, unless some remedy is found, the delay is likely to prove disastrous to the Company, and that the public are being "deprived of the benefit which they will receive from the supply of the electric light." The Company feel that they have a strong claim upon the Corporation to assist them, so far as this can be done without injury to the public interests. They believe that the Corporation and themselves are agreed upon all points connected with the Licence, and that no difference of any kind is likely to arise in the future between the Corporation and themselves. They are most anxious to comply with all the regulations of the Corporation; and in order to meet the objection which has been raised, are willing to deposit with the Corporation a suitable sum of money, and to enter into an agreement that this sum shall, from time to time, be applied in or towards payment of any penalties that may be incurred, or of any expenses in which the Corporation may be involved by default on their part.

Kineton Gas Company.—This small Company appears to be in a thriving condition, and is making some headway. During the year ending on the 1st ult., they sold 1,969,500 cubic feet of gas; being 217,900 feet more than in the preceding year. The Directors have paid a dividend of 3s. per share to the proprietors, which is equal to 7½ per cent.

The Sewerage of Sydney.—The New South Wales Parliament has recently authorized the construction of some extensive sewerage works in that colony, and the Government are about to proceed with the sewerage of the western suburbs of Sydney at an estimated cost of £1,817,896; also with the sewerage of St. Leonard's and other North Shore boroughs, at a cost of £106,000; and of the borough of Manly, at a cost of £34,000. The population of Sydney and its suburbs now amounts to nearly 400,000; but the sewers are designed for a prospective population of some 750,000 persons. The Engineer who has devised these works is Mr. George H. Stayton, M. Inst. C.E., formerly of London. Mr. Stayton is now on a short visit to England; the Government having commissioned him to inspect and report upon the latest systems of sewage purification and sanitation.

The Recent Exlosion at the Albert Gate.—At the meeting of the Vestry of St. Margaret's and St. John's, Westminster, last Wednesday, the Surveyor reported the recent explosion of gas at the Albert Gate (see *ante*, p. 887); and the Works Committee recommended that the attention of the Board of Trade should be called to the occurrence, with a suggestion that an inquiry should be made in the interests of the public safety. Mr. Verity said the Kensington and Knightsbridge Electric Lighting Company were building their culverts specially close to the lamp-posts. If the Vestry wished to erect a new lamp-post, they would be obliged to break down the culvert wall. He asked the Surveyor whether he could give any information on the matter. The Surveyor replied that in one case the Company had erected their culverts in close proximity to the lamp-posts; but they had expressed their willingness to keep clear of the posts in the future. The explosion was caused by an accumulation of gas. The recommendation of the Committee was approved.

Port Chalmers Gas Company.—The first balance-sheet of this Company was presented to the shareholders at a meeting held on the 28th of September last. The period embraced therein is from June 30, 1888, to Aug. 31, 1889, or 14 months; the date of closing the accounts being determined by the resolution of shareholders at the previous general meeting. The profit and loss account, inclusive of the amount brought forward from June, 1888, showed a net balance of £272 8s. 8d. or upwards of 10½ per cent. on the capital paid up. A considerable amount, however, remains unpaid of the calls on the shareholders originally projected in the prospectus; and these the Directors have not till recently demanded, in view of the delay in obtaining title to the site arranged for the erection of the new works. These calls are subject to 8 per cent. interest; but, on the other hand, they participate in any dividend declared—the amount of such dividend being applied in liquidation of the calls. Taking these into account for dividend, along with the capital paid up, the amount participating in the division of profits would be £3840, on which the Directors recommended a dividend of 7 per cent., which would absorb £268 16s. of the profit. The Directors' report, from which the foregoing particulars are extracted, was adopted.

Completion of a New Gasholder at Tunbridge Wells.—Last Saturday week, a new gasholder, which has been in course of construction at the Tunbridge Wells Gas-Works was completed, and the Chairman of the Company (Mr. W. H. Delves) turned the gas into the holder in the presence of the Directors and others. Light refreshments were served in the office of the Manager (Mr. A. Dougall); and the Chairman gave a short account of the construction of the tank and holder, alluding in complimentary terms to the very satisfactory way in which the Contractors had carried out their work. The tank, which was built by Messrs. J. Mowlem and Co., is of brick, with cement rendering, 114 feet in diameter by 35 feet deep to the landing stones. The holder, which is telescopic, was constructed by Messrs. Samuel Cutler and Sons, of Millwall. The inner lift is 109 ft. 2 in. by 35 ft., and the outer lift, 111 ft. 5 in. by 35 ft.; the capacity being 650,000 cubic feet. The guide-framing (a description of which was given in the Journal for July 30 last, p. 215) is the patent of Mr. Samuel Cutler, and is the first of the design yet erected. The Chairman, in the course of his remarks, feelingly alluded to the decease of the Company's Consulting Engineer, Mr. R. P. Spice, under whose advice the tank and holder had been commenced; and expressed the great regret felt by the Directors that Mr. Spice had not lived to witness the completion of the work, in which he had taken very great interest.

NOTES FROM SCOTLAND.

(from our Edinburgh correspondent.)

Edinburgh, *Saturday*.

In this quarter the air still rings with discussion upon the relative merits of gas and electric lighting. Edinburgh is in a quandary over it; and my advice to the ruling spirits is to get out of that condition as soon as possible, else their indecision will be the best opportunity which the promoters of electric lighting could obtain. What troubles them is the recent acquisition of the gas undertakings. The Gas Commissioners seem to look upon it as too bad that they should be disturbed just as they are settling down to a profitable business. The Town Council is inclined to sympathize with the Gas Commissioners; their predominant feeling being that it would be *infra dig.* of them to begin a lighting venture of their own account, in opposition to the Gas Commissioners, and that, if they allow another body to acquire lighting powers within their bounds, they will, at some future time, have to go through the process of buying up those powers—an experience which, when they look back upon their gas negotiations, they shrink from. One cannot withhold sympathy from both bodies on account of the rather awkward dilemma in which they are placed; but, on the other hand, they are the representatives of a community whose interests are sufficiently important to command a respectful hearing at the hands of the Board of Trade—if they are intelligently stated. That being so, it savours of a trifling with the subject, and a waste of time, to go before the Board of Trade with the rather specious plea that as yet it has not been determined who is the Local Authority in the city under the Electric Lighting Acts. That was the attitude taken up by the Town Council, after much labour, at its meeting last Monday. The Gas Commissioners had resolved to oppose the electric light applications; but it subsequently transpired, on the opinion of the Lord Advocate, that they are not the Local Authority. That is a reasonable opinion, because the town of Leith is associated with Edinburgh in managing the gas supply; and besides, the Gas Commissioners took no power in their Act to supply any light save gas. The subject was thus forced upon the Town Council, the Lord Provost's Committee of which recommended that they should refuse their consent to the applications; that they should oppose them; and that in the meantime they should postpone further consideration of the subject. This recommendation was not adopted. There was a long discussion upon it, in the course of which several suggestions were made, all of which, with one exception, were framed so as to have the effect of making the Board of Trade believe they were anxious to do something, without committing them to do anything. The exception was put forward by two new members of the Council, one of whom was Mr. George Auldjo Jamieson, C.A., who, it will be remembered, although then an outsider, was the fiercest of all the opponents of the gas transfer. His proposal was that they should cease opposition, and try to come to terms with some of the applicants. The Council could scarcely make such a complete somersault as this proposal involved; and the resolution ultimately adopted (but only by 14 votes to 13) was that they approve generally of the report of the Lord Provost's Committee, with this modification—that it be resolved to apply for powers to introduce electric lighting into the city when the legal difficulty now in the way has been removed, or to arrange for its introduction otherwise, and remit to the Lord Provost's Committee for further consideration and report. What frightened the councillors into this position, was the opinion of Major Marindin that a general objection would not do. I am inclined to say that this was an unreasonable fear. Major Marindin's opinion cannot override an Act of Parliament, and the Electric Lighting Act of 1888 says that the Board of Trade, before granting a Provisional Order to a company against the wish of a local authority, must be of opinion that, "having regard to all the circumstances of the case, such consent ought to be dispensed with." Objections on the part of Edinburgh would be far from being "merely general." They could be quite specifically pleaded before any tribunal. To be sure, before that could be done they would require to be formulated; and where I find fault with the Lord Provost's Committee was that, in reporting their recommendation, they backed it up with no reason whatever beyond what was, from beginning to end, of the most general description. It is several months since the notices were served upon the Council, and yet no one in the Council was able to give more than newspaper reports as the authority for their views. Why had they not instructed their Clerk to procure, from places where electric lighting has been established, reliable information as to its cost, the demand for it, and how it has worked? And why did they not also endeavour to enlighten the Council, and through them the community, upon the capability of the applying Companies to undertake what they offered to do? The Council was left to grope its way to a conclusion; and the conclusion it came to will not hold water. The authorities are simply drifting into expense which might be avoided if they would inform themselves on the subject, and then do their duty.

In contrast with the dilatory action in Edinburgh, may be mentioned that in Dundee and Aberdeen. In both these places it has been resolved to go in for a Corporation scheme of electric lighting; but in neither was a decision come to without inquiry. In Dundee, the Gas Commission has taken the matter up, and holds the field. A joint meeting of the Town Council and Police Commission was held on Tuesday, at which these bodies, looking at the matter in the view that they may yet be called upon, as the Local Authority, to go on with the scheme, favoured a report by a professional man as to the cost of putting down a system, so that they might judge of the relative cost of gas and electric lighting. Before resolving on this, however, it was agreed to hold a joint meeting with the Gas Commissioners on Monday, at which this and other matters will be talked over, and whoever may be decided to be the Local Authority will go on with the scheme.

A way out of the peculiar position into which the litigation by Messrs. Mackay and Co., brewers, Edinburgh, against the Edinburgh Gas Company and the Edinburgh and Leith Gas Commissioners, to which I referred in my "Notes" on June 18 last, has not yet been discovered. The process reached what was expected to be its final stage yesterday; and there was great surprise when their Lordships were unable to unravel the tangled skein. Instead of attempting it, they recommended that the proceedings, which have been in progress since October, 1888, should be withdrawn and begun afresh on a proper footing. Such a curious piece of litigation I have never seen; and I am doubtful whether it has yet reached a stage when it will have a clear course before it.

The Perth Gas Commissioners have resolved to insure their servants, under the Employers' Liability Act, with an Edinburgh office, the premium to be paid being at the rate of 1s. 9d. per £100 of wages. This is not always good news for the workman, because the invariable rule of the insurance companies is to dispute every claim which they think they have a chance of successfully questioning; and it is much more difficult for the claimant to sue when a powerful company is the real party defending.

The difference of opinion between the Edinburgh and District Water Trust and the Clippens Oil Company, with reference to the pipe track of the Trust, brings the two bodies into conflict every now and again. Last

time attention was drawn to it, the Trustees complained that the working of shale by the Company below their pipe track was likely to endanger it. That was nearly two years ago; and though the matter went out of notice, no satisfactory arrangement was arrived at, and the Trust have again commenced litigation on the subject. On Tuesday of last week Lord Kinnear, in the Court of Session, closed the record in an action in which the Trust sue the Company for declarator that they are proprietors of a piece of ground on the estate of Pentland, through which the pipe for conveying the water of Crawley Springs to Edinburgh is laid, extending to upwards of four acres; and decree is asked for £500 as damages for the alleged improper working of shale from below the land. The Trust founds upon a title which was granted by Mrs. Gibsone of Pentland to the Directors of the Edinburgh Water Company, whose successors they are. They state that the Company have worked the Straiton seam of shale in an improper and unskilful way, which prevents them from getting access to their shale. The Company, in defence, state that they are lessees of the Pentland shale under a lease granted by General Gibsone, which does not except the minerals claimed by the Trust; and they maintain that their works have been conducted with care and skill. Though the action is laid in this form, its object is manifestly to prevent the shale from being worked out below the pipe track, as the Trust have no intention of working it.

The water-works for Montrose which were designed and executed by the late Mr. John Reid, of Leith, when he was stationed at Montrose, proved equal to the supply of the town until recently, when, owing to the growth of the place, it was found necessary to supplement them. This has been successfully accomplished by means of a turbine wheel for the raising of water. At the last meeting of the Police Commissioners, it was reported that the wheel, which has been in use for some time, was giving entire satisfaction. The cost of the work was estimated at £1250; but the actual cost was £1588. Provost Scott expressed the pleasure of the Commissioners at the conclusion of such a satisfactory piece of work, by means of which, he said, Montrose had now a supply of water as good and cheap as any town in Scotland.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

The subject of electric lighting has for a number of weeks past been receiving much attention from the Glasgow Corporation Gas Committee, the General Manager (Mr. W. Foulis), and the Town Clerk (Sir James Marwick). A Provisional Order was drafted some time ago, so that application for the necessary powers under the Act of Parliament might be made on behalf of the city; but a difficulty arose as to the correct interpretation of the Act on the question of the proper body to be regarded as the Local Authority. The Town Council, the Police Board, and the Gas Trust are absolutely one and the same body; but which of them should be consid red as the Local Authority was and still is a debateable question. By way of getting out of the difficulty, it has been resolved, I believe, to apply to Parliament both for a Provisional Order and for powers as to electric lighting in a Private Bill, which is at the same time to embrace a number of other things. A feeling is arising that Messrs. Muir, Mavor, and Coulson, Limited, who have started a central electric lighting station from which they are supplying current to a considerable number of customers, will be able to command very favourable terms from the municipal authorities when they are letting out their powers as purveyors of electric light under the Act. Negotiations have already been opened between the Gas Committee and Messrs. Muir, Mavor, and Coulson; but the former have not in any way committed the Gas Trust as to terms. I may say that the Company is a very strong one, having excellent backing from wealthy public citizens—gentlemen who are able to command respect from the city authorities in regard to any proposals that may be submitted to the Electric Lighting Company. If Messrs. Muir, Mavor, and Coulson can effect a satisfactory arrangement with the Gas Committee, it is very unlikely that they will on their own account apply for a Provisional Order in connection with the adoption of the Act in Glasgow. I may further mention that the local position of the Company is being strengthened almost daily by securing additional customers for "current" from their central station. They are supplying the General Post Office in George Square; and a still more notable fact is that in the new pile of buildings close by, known as the City Chambers, they have the municipal authorities themselves as customers. Indeed, the counters where the gas and water accounts are paid are almost constantly illuminated with electric lights. This certainly seems to be a somewhat anomalous condition of things. The public announcement of the fact that the city is seeking powers under the Electric Lighting Act will, I believe, be made within the next few days.

It is not unlikely that there will be a collision in next session of Parliament between the Glasgow Corporation and the Partick, Hillhead, and Maryhill Gas Company, in consequence of the Company applying for very extensive powers in reference both to gas supply and electric lighting over a large area. I am told that an eminent London Gas Engineer has been down here for some time giving his professional assistance in surveying the district, studying its wants, and in drafting the Bill which is to be presented to Parliament in due course. The Bill asks for powers to the Company over an area that was covered by the authority of one of the Gas Companies whose powers were bought up by the Glasgow Corporation in the Gas Act of 1869. At least, so I am told.

For some time past complaints have been made by the consumers regarding the illuminating power of the gas at Ardrossan; and in reference to them it was declared by the Town Clerk, at last Monday's meeting of the Burgh Commissioners, that 24 candles was now the quality of the gas registered. He also stated that the Commissioners intended to have independent testings of the illuminating power, and that arrangements were being made to have a proper testing apparatus procured for the use of the Manager. At the same meeting, the Clerk read a letter from Mr. Robert R. Tatlock, the Gas Examiner of Glasgow, who had lately tested the gas in use in the town, which he found to have an illuminating power of 24·36 candles. Mr. Tatlock had also reported incidentally regarding the unsatisfactory condition of the testing apparatus and other appliances.

A report comes to me from Johnstone to the effect that the Burgh Commissioners, who are also Gas Commissioners, have received a very good offer for the residual products at the gas-works. It is stated to be about £200 above that obtained for the same materials last year. A year or two ago the amount received for the residuals was less than £100, whereas at one time as much as £500 had been received for them. Recently the price of gas at Johnstone was reduced 5d. per 1000 cubic feet, and the wages of the men have been advanced 1s. to 2s. per week—the range now being from 18s. to 30s. per week.

At the end of October, there had been collected by the Glasgow Gas Treasurer, in the shape of outstanding gas-rents, not less than £46,178, whereas the balance-sheet at the end of the last financial year made the estimate £40,879; so that there had then been recovered above the estimate the sum of £5299.

The last statement that I have been able to get regarding the Glasgow Corporation Gas-Stove Department shows that there were on hire 6176 stoves and range-fittings, and that the sales of stoves and heating appliances amounted to 7172.

It is estimated that the reconstruction of the Glasgow water-mains (chiefly in the centre of the city), consequent on the cutting of an underground railway between the east and west ends of the city will cost something like £21,500, which must, of course, be paid by the Railway Company whose scheme is to be carried out.

On Thursday, the shares of the Partick, Hillhead, and Maryhill Gas Company, Limited, were sold on the Glasgow Stock Exchange at £5 7s. 6d. per share; being an advance of 2s. 6d.

The demand in the sulphate of ammonia market continues to be somewhat dull, and business cannot be done at much, if anything, above from £11 16s. 3d. to £11 17s. 6d. per ton, although it is stated that up to £12 has lately been asked for forward delivery.

The Glasgow pig-iron market has again been very much excited this week; and Scotch warrants, after opening on Monday at 60s. 9d. per ton, advanced on Tuesday to 64s. 2d., but closed yesterday afternoon at 63s. 2d. per ton cash buyers, after 61s. 4d. had been accepted in the morning. The trade that is being done is on an extremely large scale; and the production has already been somewhat augmented, and, if present prices be maintained, will no doubt soon increase more rapidly. A large reduction —between 6000 and 7000 tons—has been made this week in stocks in the public stores.

Prices of coal continue to increase; and in all directions a prosperous condition of things is the rule.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 16.

Sulphate of Ammonia.—A better feeling prevails; and prices display a slightly upward tendency. To-day's quotations are £12 f.o.b. Hull; £11 18s. 9d. f.o.b. Leith and Liverpool. As the dealers are the principal buyers, it is as yet difficult to ascertain whether the somewhat large business transacted is to supply *bonâ fide* orders, or whether the purchases are made principally in anticipation of an advance. There is certainly not too much sulphate offering at the moment; and the demand seems likely to continue on a fair scale from all quarters. At the same time, buyers seem disinclined to pay any advance on present values for spring delivery. Nitrate continues flat at 8s. 3d. to 8s. 4½d. per cwt.

LONDON, *Nov.* 16.

Tar Products.—The fluctuations during the week have been unimportant. Benzols are firmer, and pitch is steadier; but anthracene is scarcely so strong. Buyers appear either to have contracts running, or are holding off the market. Prices: Pitch, 30s. to 36s. per ton. Tar, 27s. to 32s. 6d. per ton, according to position. Benzols (90 per cent.), 3s. 4d. per gallon; (50 per cent.), 2s. 4d. per gallon. Toluol, 1s. 6d. per gallon. Solvent naphtha, 1s. 7d. to 1s. 9d. per gallon. Crude naphtha (30 per cent.), 1s. 2d. per gallon. Light oil, 4d. per gallon. Creosote, 2¼d. per gallon. Carbolic acid (60's), 3s. 4d. to 3s. 5d. per gallon. Cresylic acid, 10d. per gallon. Anthracene (30 per cent.), "A" quality, 1s. 1d. per unit; "B" quality, 11½d. per unit.

Ammonia Products.—Sulphate is easier, at £11 16s. 8d. to £12 per ton. Other prices may be taken as follows:—Gas liquor (5° Twaddel), 7s. to 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1¾d. per lb. Carbonate of soda, 3¼d. per lb. Muriate of ammonia, brown, £22 per ton; white, £29 per ton. Sal-ammoniac, £34 to £36 per ton.

THE PRICE OF GAS AT NORTH ORMESBY.—The Local Board of North Ormesby and the Gas Company are at variance respecting the price charged for gas; and at the meeting of the former last Thursday, the matter was discussed in rather an animated manner. The Board require that the price should be reduced to 2s. 6d. per 1000 cubic feet, and the charge for lamps to 17s. 6d.; but in view of the advance in the price of coal and the increased wages of the men, the Company do not see their way to accede to the demands of the Board. The latter decided last Thursday that a deputation should wait upon the Directors of the Company, and also that the Clerk should apply to the Middlesbrough Corporation for the terms on which they would supply the town with gas.

THE ELECTRIC LIGHTING INSTALLATION AT LEAMINGTON.—The Town Clerk of Leamington has had an interview with Messrs. Chamberlain and Hookham with reference to their contract for the supply of electric light in the borough, and he has drawn up a report on the result of the conference. The electric lighting contractors expressed their readiness to supply the light on the terms of the existing contract, to be determined by three months' notice by either party on the usual quarter days. The necessity of improving the light was pressed by the Town Clerk upon Messrs. Chamberlain and Hookham, who stated that "if their tenure was not of such a precarious nature," they would suggest that a lesser number of lights should be used, and greater power given to those remaining, which would improve the appearance of the lighting.

EXTENSIONS AT THE BLAENAVON GAS-WORKS.—The Blaenavon Gas and Water Company, Limited, acting upon the advice of their Manager (Mr. C. White), decided, early in the present year, to provide additional gas storeage at their works, and accordingly advertised for tenders for building a new tank and furnishing a 50 ft. by 18 ft. single-lift gasholder. The tender of Mr. A. P. Williams, of Blaina, Mon., was accepted for the excavation and building of the tank; and that of Messrs. Willey and Co., of Exeter, for providing and fixing the gasholder. The ground in which the tank is placed presented some difficulties, in consequence of its unstable character, and the rock which was found, in places only, showed some very large fissures. As no puddle was to be used, it was important that every care should be bestowed upon the details of the work to ensure soundness. The tank is built of brick upon a cement concrete foundation, having a "dumpling" in the centre, which, with the bottom, is covered with cement concrete, the whole inner face of the tank being rendered with neat cement; and upon being filled with water after the gasholder was fixed, it was found to be absolutely sound. It stands 4 feet above the ground line, and with the gasholder, which has also been completed in a most satisfactory manner, forms not only a valuable addition to the works, but both reflect the greatest credit upon the firms in whose hands the contracts were placed. Messrs. Willey and Co. have also carried out extensions of the condensers, and removal of scrubbers, during the summer months; thus placing the works in a position to fully meet the steadily increasing demand for gas. The whole of the alterations and additions, as also the rearranging of mains, &c., have been carried out under the direction and personal supervision of the Company's Manager.

ELECTRIC LIGHTING IN ROME.—A contract, says a correspondent of the *Standard* in Rome, has been signed between the Municipal Authority and the Anglo-Romano Gas Company for the illumination of the city and the suburbs by the electric light. Altogether, 167 electric lights will take the place of 706 gas lights, at an increased expense of nearly 26,000 frs. annually. The motive power will be derived from the waterfalls at Tivoli; and the distributing station will be near the Porta Pia. The contract provides that the whole of the work for the complete illumination of the city and suburbs shall be in working order in one year and eleven months from the present time.

THE DANGERS OF OIL LIGHTING.—Another danger of oil lighting in the public streets has been reported to the Erith Local Board. A lamp has exploded at Belvedere, and created considerable alarm. The legal adviser to the Board has been instructed to make a report on the question as to whether the lighting contractors are liable for causing fright or accident in consequence of their lamps exploding. We learn that during the past quarter Messrs. Defries have been fined ten guineas for lamps found unlighted; and a letter has been written to them stating that if the quality of the light is not improved an expert will be appointed to test it, to see if the contract is not being broken.

THE NORTHERN COAL TRADE.—Although there is still a good demand for coal generally, the steam coal trade is a little easier, and prices are weaker. About 10s. 6d. is the quotation for best Northumberland coals; but second qualities vary more in price. Small steam coals sell freely at about 6s. per ton free on board, which is double the rate of a year ago. Gas coal is now in very strong request; but the production is larger than it was, and the demand is more readily met. The prices vary greatly—coal being delivered at from 6s. per ton on old contracts up to 11s. per ton for the same quality on recent sales for single cargoes. The demand for smithy coals is equally good; and some of the gas collieries are now selling large quantities at prices equal to the current rate for gas coals. Household qualities of coals do not sell so readily as usual at this time of the year. Manufacturing coals sell freely at good rates; and for coals for steamships the demand is good.

SALE OF STOCK OF THE NEW RIVER COMPANY.—At the Auction Mart, Tokenhouse Yard, E.C., last Wednesday, Mr. Bousfield, of Messrs. Edwin Fox and Bousfield, sold by auction half of an Adventurer's share and one-fifteenth of a King's share in the New River Company; also £5000 of four per cent. debenture stock of the same concern. The first lot consisted of an entire sixth part of an Adventurer's share, with an income attaching to it of £431 13s. 4d. per annum. The bidding commenced at £12,000, and quickly reached £16,700, at which figure the lot was knocked down. After this three-eighths of an Adventurer's share was sold in lots, each consisting of a 120th part of the entire share. Of these lots, 1 sold at £860; 1, at £840; 5, at £830; 5, at £825; 35, at £820; and 5, at £810. Next a 130th part of a King's share was offered, and realized £720. The second part of the sale consisted of £5000 of four per cent. debenture stock. Of this, £400 sold at £130 10s. per cent.; and the remainder (£4600) at £130 per cent.

PROPOSED NEW WATER-WORKS FOR BAILDON.—Last Friday evening a public meeting was held at Baildon, under the presidency of Mr. J. Waugh, to consider a scheme of water supply which it is proposed to carry out at an estimated cost of £16,000. The Chairman explained that the inhabitants had now a supply equal to about 50,000 or 60,000 gallons, and a consumption of nearly 90,000 gallons per day, so that a great deal of the water had to be purchased. Their present works were of a very limited capacity; amounting to a storeage of 9 million gallons, which had involved an expenditure of between £15,000 and £16,000. Of this only some £7000 was now owing. They had a fairly satisfactory income from their existing water supply. The question before the meeting had for a considerable time been a serious one at Baildon, and they wanted now to go in for a scheme which would give the township a service of water adequate to all requirements for the next 25 or 30 years. What they proposed to do was to construct a reservoir of a capacity of 30 million gallons, which would be equal to 200 days' supply, and would provide for a consumption equal to 200,000 gallons per day. At present they had only 90 days' supply. He concluded by moving a resolution authorizing an application by the Local Board to Parliament for power to carry out the scheme, and it was agreed to.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 961.)

Issue.	Share	When ex-Dividend.	Dividend of Dir. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
580,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	17—18	−½	5 16 9
100,000	10	„	7½	Do. 7 p. c.	10	12½—18½	..	5 11 1
800,000	100	1 July	5	Australian (Sydney) 5% Deb.	100	110—112	+1	4 9 3
100,000	20	30 May	8½	Bahia, Limited	20	22—25	−3	6 8 0
200,000	5	14 Nov.	7½	Bombay, Limited	5	6⅞—7¼*	..	5 3 5
40,000	5	„	7½	Do. New	4	4½—5½*	..	5 14 1
880,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	225—230	..	5 6 6
125,000	„	„	9½	Do. New	100	162—167	..	5 10 9
220,000	20	12 Sept.	11	Brighton & Hove, Original	20	42—44	..	5 0 0
320,000	20	27 Sept.	11½	British	20	44—46	..	4 17 10
50,000	10	12 Sept.	11	Bromley, Ordinary 10 p. c.	10	20—22	..	5 0 0
89,000	10	„	8	Do. 7 p. c.	10	16—17	..	4 14 1
328,750	10	14 Nov.	10	Buenos Ayres (New) Limited	10	13½—14¼*	+½	6 18 0
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	107—110	..	5 9 1
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Oct.	13½	Commercial, Old Stock	100	245—255	..	5 7 10
130,000	„	„	10½	Do. New do.	100	205—210	..	5 2 4
130,000	„	28 June	4½	Do. 4½ p. c. Deb. do.	100	122—125	..	3 12 4
557,320	20	14 June	13	Continental Union, Limited	20	48—49	..	5 6 2
242,680	20	„	13	Do. New '69 & '72	14	33—35	..	5 4 0
200,000	20	„	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	27 Sept.	10	Crystal Palace District	100	200—205	..	4 17 7
234,060	10	26 July	13	European, Limited	10	23¾—24½	..	5 6 1
120,030	10	„	13	Do. New.	7½	17—18	..	5 8 4
354,060	10	„	13	Do. do.	5	11½—12	..	5 8 4
5,470,040	Stck.	14 Aug.	13½	Gaslight & Coke, A, Ordinary	100	243—248	−1	5 10 10
100,000	„	„	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	„	„	10	Do. C, D, & E, 10 p.c. Pf.	100	253—258	+2	3 17 6
80,000	„	„	6	Do. F, 5 p. c. Prf.	100	123—128	..	3 18 1
60,000	„	„	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 4
1,300,000	„	„	7	Do. H, 7 p. c. max.	100	158—163	..	4 5 10
463,000	„	„	10	Do. J, 10 p. c. Prf.	100	250—255	..	3 18 5
1,061,150	„	14 June	4	Do. 4 p. c. Deb. Stk.	100	118—122	..	3 5 7
294,850	„	„	4½	Do. 4½ p. c. do.	100	125—130	..	3 9 3
650,000	„	„	6	Do. 6 p. c. do.	100	167—172	..	3 9 9
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	209—213*	−1½	5 12 8
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p.c. Deb.	100	113—115	..	4 6 11
541,920	20	14 June	6	Monte Video, Limited	20	20—21	..	5 14 3
150,000	5	30 May	10	Oriental, Limited	5	8⅞—9¼	..	5 8 1
60,000	5	27 Sept.	7	Ottoman, Limited	5	5⅞—6¼	..	5 12 0
166,870	10	26 July	4	Pará, Limited	10	4—5	−½	8 0 0
				People's Gas of Chicago—				
430,000	100	2 Nov.	6	1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	1 June	6	2nd Do.	100	98—102	..	5 17 8
100,000	10	16 Oct.	10	San Paulo, Limited	10	16—17	..	5 17 8
500,000	Stck.	29 Aug.	16⅔	South Metropolitan, A Stock	100	800—810	..	5 4 10
1,350,000	„	„	13½	Do. B do.	100	223—227	−1	5 6 10
141,500	„	„	13½	Do. C do.	100	240—250	..	5 6 0
600,000	„	28 June	5	Do. 5 p. c. Deb. Stk.	100	138—142	..	3 10 5
60,000	5	12 Sept.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
						*Ex div.		
				WATER COMPANIES.				
717,467	Stck.	14 June	9½	Chelsea, Ordinary	100	266—271	−2	3 10 1
1,720,560	Stck.	16 Oct.	7½	East London, Ordinary	100	213—217	..	3 9 1
544,440	„	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	143—146	..	3 1 7
700,000	50	14 June	9	Grand Junction	50	128—132	..	3 8 2
708,000	Stck.	29 Aug.	10½	Kent	100	276—281	..	3 14 9
1,043,800	100	28 June	9½†	Lambeth, 10 p. c. max.	100	257—262	..	3 12 6
406,200	100	„	7½	Do. 7½ p. c. max.	100	200—205	..	3 13 9
200,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	119—122	..	3 5 7
500,000	100	14 Aug.	12½	New River, New Shares	100	323—328	..	3 5 10
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
902,300	Stck.	28 June	6	S'thwk & V'xhall, 10 p.c. max.	100	170—175	..	3 8 6
1,126,500	100	„	6	Do. 7½ p. c. do.	100	168—172	..	3 9 4
155,066	Stck.	14 June	10	West Middlesex	100	265—270	−2	3 14 1

† Next dividend will be at this rate.

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

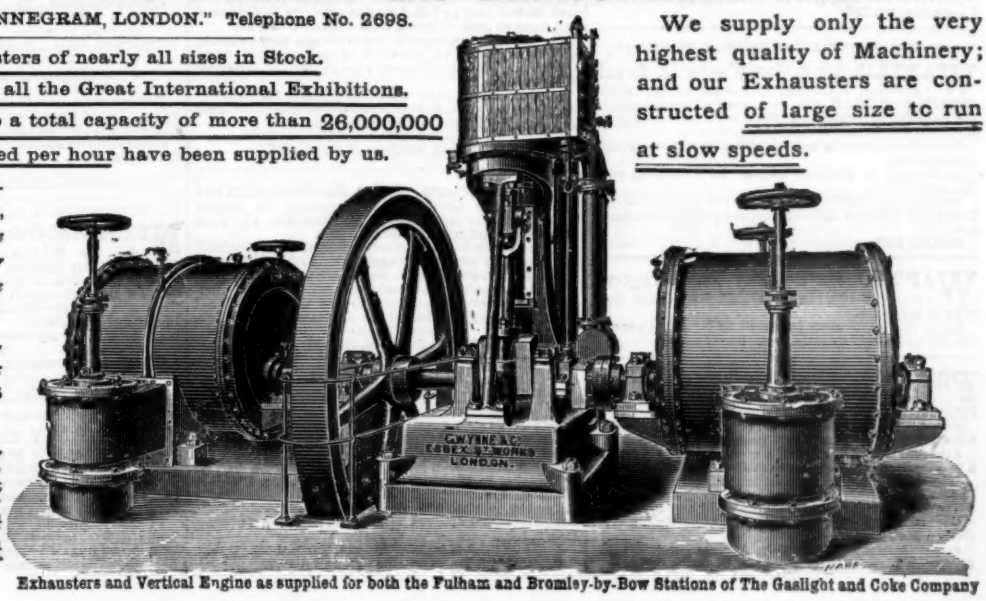
Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.

We supply only the very highest quality of Machinery; and our Exhausters are constructed of large size to run at slow speeds.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United-Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited
Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to
No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
No. 54, BERNARD STREET, LEITH, }

TAR and Liquor wanted.
BROTHERTON AND CO., Commercial Buildings, LEEDS.

HUTCHINSON BROTHERS, Barnsley,
Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

LEADING Stoker wanted at once by a Suburban Gas Company. He must be Sober, Steady, and Trustworthy, and capable of Driving an Engine and Exhauster, and looking after the Boiler, &c. Only those who have filled a similar Situation need apply. Wages, 39s. per week.
Apply, by letter, to No. 1765, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE GAS INSTITUTE.

APPOINTMENT OF SECRETARY.

THE Council are prepared to receive APPLICATIONS from Gentlemen for the vacant SECRETARYSHIP of the above Institute.
Particulars as to Salary, Schedule of Duties, &c., can be obtained on application to the undersigned, to whom all applications, endorsed "Secretary," must be delivered on or before Wednesday, Nov. 27 inst.
WILLIAM LONGWORTH, Hon. Sec.
Gas Offices, Guildford, Surrey,
Nov. 16, 1889.

WORKING Manager, used to Clay Retort Setting, Exhaust, &c., wanted for the Brecon Gas-Works. Make 20 millions. Wages to commence, 35s. per week, with House, Coals, and Gas.
Applications, with three recent testimonials, to be sent in on or before the 1st of December to EDWIN A. WRIGHT, SECRETARY.

BOROUGH OF ABERAVON.

WANTED, immediately, a practical GAS-WORKS FOREMAN, who must also be a competent Fitter, to take charge of small Gas-Works.
Early applications, with references, and stating salary required to be sent to the Town Clerk, Aberavon, Port Talbot, from whom any further particulars can be obtained.

WANTED, a Resident Foreman for Chemical Works. House, Coal, and Gas provided. Must have experience in Sulphuric Acid and Sulphate of Ammonia Manufacture and Tar Distillation.
Apply, by letter, stating age, experience, and salary required, to No. 1764, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

RETORT-HOUSE AND GENERAL FOREMAN.

WANTED, for a Gas-Works in South America, a thoroughly competent RETORT-HOUSE FOREMAN, who has also had experience in the Erection of Apparatus. He must be under 40 years of age, and references unexceptionable.
Pay £15 sterling per month, with a Free Second-class Passage out.
Copies only of testimonials may be forwarded with the application.
Applications, stating full qualifications and particulars, to be made to Mr. JOHN EUNSON, C.E., NORTHAMPTON.
Nov. 12, 1889.

WANTED, six Railway Tank-Wagons, (each holding about 2000 gallons), to Hire, with view to purchase.
State full particulars in detail to No. 1761, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C

FOR SALE—Single Gasholder, 60 feet diameter by 23 feet deep. Capacity, 65,000 cubic feet; fixed complete; in good condition.
Also one Single GASHOLDER, 80 feet by 20 feet deep, ten Cast-Iron Columns and Wrought-Iron Girders.
Also four PURIFIERS in a group, 16 ft. by 12 ft. by 3 ft. 9 in. deep; 12-inch Centre-Valve and Connections.
Would erect the above, and make practically equal to new.
Inquiries invited for various second-hand Gas Plant—Gasholders, Tanks, Purifiers, Washers, Exhausters, Station Meters, &c.
Apply to SAML. WHILE (late Ashmore and While), 60, Queen Victoria Street, LONDON, E.C.

TIMMIS & CO., of STOURBRIDGE
Make only the best quality of
FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS.
Also SPECIAL SILICA BRICKS, to stand great heats.
All descriptions kept in Stock.
For Prices apply to JAMES LAWRIE AND Co, 1, Whittington Avenue, Leadenhall Street, E.C., Sole Agents for London and District.
Telegraphic Address: "EIRWAL, LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters.
Also for Collingwood's Regenerative Retort-Settings.
, See Advertisement p. 948 of last week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.
Telegraphic Address: "Braddock, Oldham."

SULPHATE of Ammonia Lead Work and Fittings. Lead Burner. Tanks and Saturators made and repaired on the shortest notice.
Address P. J. DAVIES, 78, Earl's Court Road, Kensington, LONDON.

FOR SALE—Messrs. R. and J. Dempster have FOR SALE, owing to the making of some extensive Alterations at the Coventry Gas-Works—
Five PURIFIERS, 20 feet square, complete with Lids, Grids, Tee-Bars, Lifting Apparatus, &c., &c. The Purifiers are of modern construction, strong and durable, having the Lutes cast on the side Plates; and all Joints are planed. The Purifiers will be sold cheap, either singly or as required to suit purchasers; and they can be delivered free on Rails, or Messrs. R. and J. Dempster will be glad to give a price delivered and fixed complete at any Gas-Works.
Also two 18-inch FOUR-WAY VALVES and Connections.
Also two LIVESEY WASHERS, capable of passing 2 million cubic feet of Gas per day each.
For further particulars, apply to Messrs. R. & J. DEMPSTER, Newton Heath, MANCHESTER.

TENDERS FOR TAR.

THE Directors of the Ludlow Gas Company are prepared to receive TENDERS for the surplus TAR produced at their Works.
For particulars apply to JAMES ELLIOTT, Manager, Gas-Works, LUDLOW.

THE Corporation of Middlesbrough are prepared to receive TENDERS for about 180 tons of SPENT OXIDE. Samples will be sent on application to the Gas Manager (E. D. Latham, C.E.)
The Corporation do not bind themselves to accept the highest or any tender.

CORPORATION OF WORKINGTON.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply and erection of One PURIFIER at their Stanley Street Works.
Drawings and specification may be seen at the Works.
Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Purifier," must be delivered at the Town Hall not later than the 25th inst.
The lowest or any tender not necessarily accepted.
HERBERT LEES,
Engineer and Manager.
Gas-Works, Workington, Nov. 7, 1889.

THE Directors of the Sheffield United Gaslight Company are prepared to receive TENDERS for two LANCASHIRE STEEL BOILERS, each 30 feet long by 7 ft. 6 in. diameter; to be delivered and fixed at their Grimesthorpe Chemical Works.
Forms of Tender, with specification and drawing, may be obtained, on payment of half-a-guinea, upon application to the Company's Engineer, Mr. Fletcher W. Stevenson.
Tenders, sealed and endorsed "Tender for Boilers," must be delivered to the undersigned not later than Tuesday, the 3rd day of December next.
HANBURY THOMAS, General Manager.
Commercial Street, Sheffield, Nov. 14, 1889.

THE Directors of the Sheffield United Gaslight Company are prepared to receive TENDERS for CONDENSERS required at their Grimesthorpe Chemical Works.
Forms of tender with specification may be obtained, and drawings seen, upon application to the Company's Engineer, Mr. Fletcher W. Stevenson.
Tenders, sealed and endorsed "Tender for Condensers," must be delivered to the undersigned not later than Tuesday, the 3rd day of December next.
HANBURY THOMAS, General Manager.
Commercial Street, Sheffield, Nov. 14, 1889.

FIRE-CLAY GOODS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the supply of FIRE-CLAY GOODS (Retorts, Bricks, &c.) required for repairs at their Neepsend and Effingham Street Stations during the next twelve months.
Specifications and forms of tender may be had on application to the Company's Engineer, Mr. Fletcher W. Stevenson.
Tenders, marked "Tender for Fire-Clay Goods," must be delivered to the undersigned not later than Tuesday, Dec. 3, 1889.
HANBURY THOMAS, General Manager.
Commercial Street, Sheffield, Nov. 14, 1889.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application.
Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour. *Delivery in Railway Tank-Wagons or Carboys*
Highest References and all particulars supplied on application.

ESTABLISHED 1869.

HYDRATED Oxide of Iron (Bog Ore). Purity and Uniformity of Quality guaranteed. Stocks kept at MINES for direct Shipments to any Port, also at Garston Docks.
GEO. G. BLACKWELL, Mine Proprietor, 25, 26, and 27, Irwell Chambers, W. LIVERPOOL.

BREEZE FURNACES FOR STEAM RAISING AND RETORT FIRING.

MELDRUM BROS. are prepared to fit up their APPARATUS *on approval* to Lancash're, Cornish, and Egg-ended Boilers.
See advertisement on title page last week.
26, Half Street, Cathedral Yard, MANCHESTER.

TENDERS FOR TAR AND LIQUOR.

THE Directors of the Sleaford Gas Company, Limited, are prepared to receive TENDERS for their surplus TAR and AMMONIACAL LIQUOR produced at their Works during the year 1890.
The Tar and Liquor will be loaded into Tank-Wagons at Sleaford Station.
For further particulars apply, to HARRY WIMHURST, Manager, Gas-Works, SLEAFORD.

SHOTLEY BRIDGE AND CONSETT DISTRICT GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the surplus TAR produced at their Works for the Year 1890.
Quantity, about 40,000 gallons.
Contractor to furnish Barrels, and accept delivery at Consett and Blackhill Station.
Tenders to be sent in on or before Dec. 3.
M. RICHLEY, Secretary.
Shotley Bridge, Nov. 15, 1889.

TO WELL SINKERS AND OTHERS.

THE Streets Committee of the Commissioners of Sewers of the City of London will meet in the Guildhall of the said City on Friday, the 29th of November, 1889, at Two o'clock precisely, to receive TENDERS for completing an ARTESIAN WELL at New Street, Gravel Lane, in the City of London, agreeably to Specification and general Conditions, which may be obtained at the Office of the Engineer to the Commissioners in the Guildhall, on payment of one guinea, to be returned on receipt of a *bond fide* tender.
Security will be required for the due execution of the Work.
The Commissioners do not pledge themselves to accept the lowest or any tender.
All tenders must be delivered in before Two o'clock on the said day; and parties sending in proposals must attend personally, or by a duly authorized agent.
HENRY BLAKE, Principal Clerk.
Sewers' Office, Guildhall, Nov. 12, 1889.

BLACKPOOL CORPORATION.

TO IRONFOUNDERS AND OTHERS.

NO. 1 Contract.—Tenders wanted for the whole of the CAST and WROUGHT IRON WORK required in the ERECTION of 24 RETORTS in four Furnaces.
No. 2 Contract.—Tenders wanted for about 12 tons of ROLLED GIRDERS and RAILWAY METALS for COAL SIDING.
No. 3 Contract.—Tenders wanted for a REVOLVING WASHER, capable of taking up the Ammonia from 1½ million cubic feet of Gas in 24 hours.
No. 4 Contract.—Tenders wanted for a Set of Four 35 ft. by 25 ft. by 6 ft. deep PURIFIERS, with Covers, Girders, Pillars, Valves, Lifting Apparatus, and Machinery complete.
Tenders must be sent in separately for each contract by the 24th of November, sealed and endorsed outside, addressed to the Chairman of the Gas Committee.
Plans and specification may be seen at the Office of the undersigned.
JOHN CREW, Gas Engineer.
Corporation Gas-Works, Nov. 5, 1889.

MONTE VIDEO GAS COMPANY, LIMITED.

NOTICE is hereby given that the Books for the TRANSFER OF SHARES will be CLOSED from Monday, the 18th of November, to Saturday, the 30th of November, 1889, both days inclusive, for the preparation and issue of Warrants in payment of an interim Dividend for the Half Year ended the 30th of June, 1889.
By order of the Board,
THOMAS F. LANE, Secretary.
Offices of the Company, Suffolk House,
Laurence Pountney Hill, Cannon Street,
London, E.C., Nov. 16, 1889.

Price 2s. per dozen, or 10s 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.
Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.
, *The Act extends to Scotland and Ireland.*

IMPERIAL CONTINENTAL GAS ASSOCIATION.

INCORPORATED BY ACT OF PARLIAMENT.

NOTICE is hereby given that the Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association was held at the City Terminus Hotel, Cannon Street, London, on Tuesday, the 12th inst.,

Sir JULIAN GOLDSMID, Bart., M.P., in the Chair,

When the following Resolutions were unanimously passed:—

"That the Report of the Directors upon the affairs of the Association be received, adopted, and entered upon the minutes.

"That a Dividend of 5 per cent. for the Half Year ended the 30th of June last, and a Bonus of 1 per cent., be declared upon the £3,800,000 Stock of the Association, and that the said Dividend and Bonus be payable, free of Income-Tax, on and after the 2nd of December next.

"That the cordial thanks of the Meeting be given to the Directors for their able management of the affairs of the Association; to the Chairman for his conduct in the Chair this day; to Mr. H. V. Lindon, Mr. L. G. Drory, the Agents, Engineers, and other Officers of the Association on the Continent, and to the Secretary and the London Staff."

By order of the Board,
R. S. GARDINER, Secretary.

30, Clement's Lane, Lombard Street,
London, E.C., Nov. 13, 1889.

Now Ready, Fcap. 4to, Cloth, Gilt Lettered, with numerous Illustrations, price 7s. 6d., post free.

Practical Photometry:

A GUIDE TO THE STUDY OF THE

MEASUREMENT OF LIGHT.

By William Joseph Dibdin, F.I.C., F.C.S.,

Member of the Society of Public Analysts and of the Committee of the London Section of the Society of Chemical Industry.

Chemist and Superintending Gas Examiner to the London County Council.

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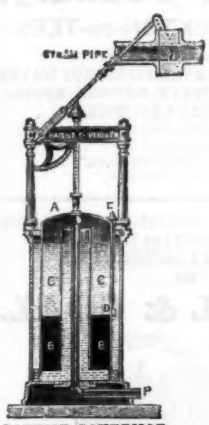

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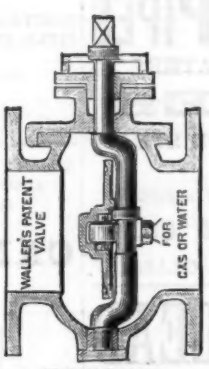

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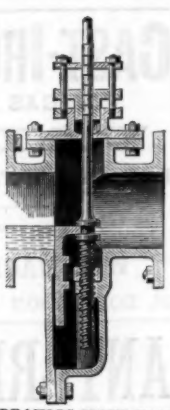

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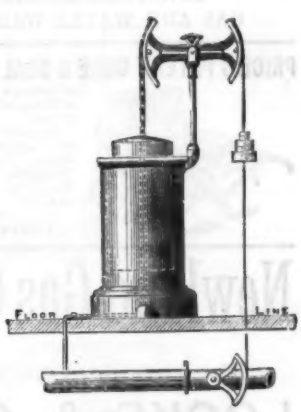

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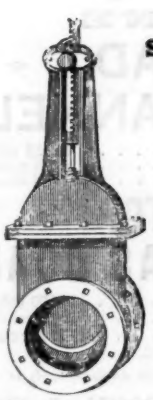

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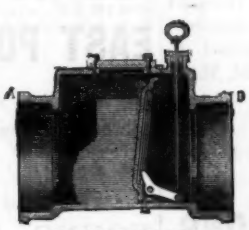

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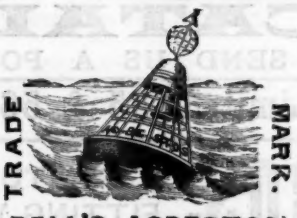

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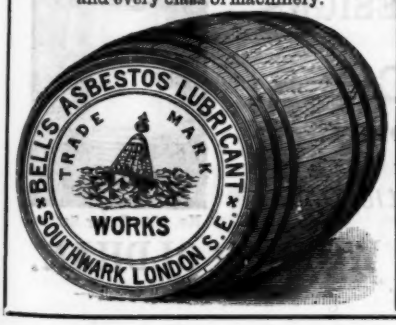

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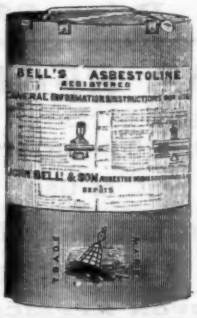

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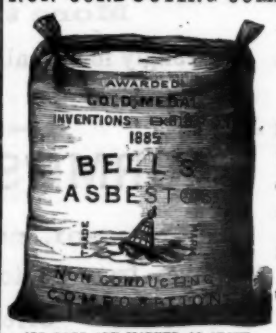


Will reduce loss by radiation, and saves 40 per cent. of fuel.

Is suitable for boilers with flat or round bottoms. Is superior to any other, and saves its cost in a few months.

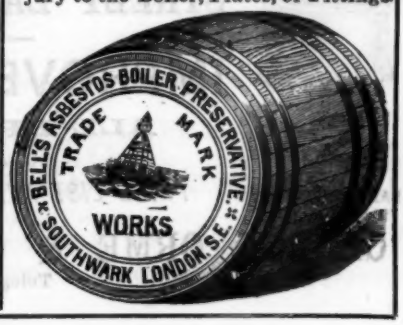
Is sent out dry in bags; therefore cheaper than others sent out wet.

ALL BAGS ARE MARKED AS ABOVE.

BELL'S ASBESTOS

BOILER PRESERVATIVE

Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



JOHN HALL & CO.,

STOURBRIDGE

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
RETORTS CAREFULLY PACKED FOR SHIPMENT.
A STOCK OF DIFFERENT SHAPES ON HAND.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.
FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS
AGENTS FOR
ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS: HUNSLET, LEEDS

LONDON OFFICE: 60, QUEEN VICTORIA STREET E.C.

AND MAKERS OF **GAS PLANT** OF EVERY DESCRIPTION.

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THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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ORME'S GAS REGULATOR FOR STREET LAMPS

No. 200.
LAMP REGULATOR
Full Size.

(Behl's Patent)

Adopted by the leading GAS COMPANIES AND CORPORATIONS.

More than 150,000 now in use.

Strongly made, all Brass, as Illustration No. 200,

Price, 24/- per dozen.

ORME'S GAS REGULATOR

(BEHL'S PATENT),

No. 201, 202, 203, FOR DOMESTIC USE,

Saves from 20 to 50 per cent. of Gas.

Gives a bright and steady Light.

Price, 15/- per dozen.

SAMPLES UPON APPLICATION.

No. 201, ¾ B Socket.
„ 202, 1/2 B Socket.

STREET LANTERNS OF NEW DESIGNS.

IMPROVED LAMP TORCHES.

ALL BRASS. EXTRA STRONG.

No. 203, Taper Screw.

PRICE LIST AND FULL PARTICULARS UPON APPLICATION.

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WORTLEY FIRE-CLAY WORKS
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth Interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP,
Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

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SOLE CONSIGNEES FOR GREAT BRITAIN & COLONIES,
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GAS and WATER ENGINEERS,

Manufacturers of and Contractors for the Maintenance of

PUBLIC LAMPS & LANTERNS:

GLASS—Flint, Opal, and Bent in Stock, and Cut to Sizes.

WELL LAMPS, STREET NAME TABLETS,

LAMP COLUMNS, HEAD IRONS, PUTTYLESS LAMPS,
LANTERN COCKS, REGULATORS,

Improved High-Power Lanterns for Lighting Street Refuges and Open Spaces.

BROWN'S PATENT
LAMPLIGHTERS' TORCHES.

PROPRIETORS AND MANUFACTURERS OF
BOX'S PATENT
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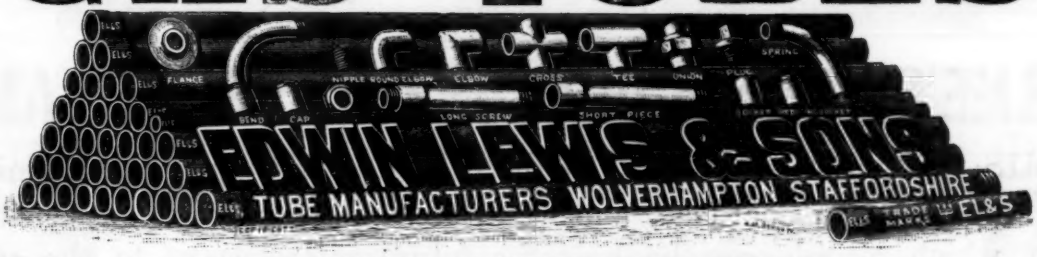
This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

S. PONTIFEX & CO., 22, COLEMAN ST., LONDON.
Works: 18, STEPHEN STREET, TOTTENHAM COURT ROAD, W.

ESTABLISHED 1825.

GAS TUBES



MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES
FOR ANY PURPOSE.

WILLEY & CO.,

GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.
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MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS,

GASHOLDERS, Telescope and Single-Lift, any size. Some of the largest in the Kingdom erected by this Firm are giving the highest satisfaction.

PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **Mr. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

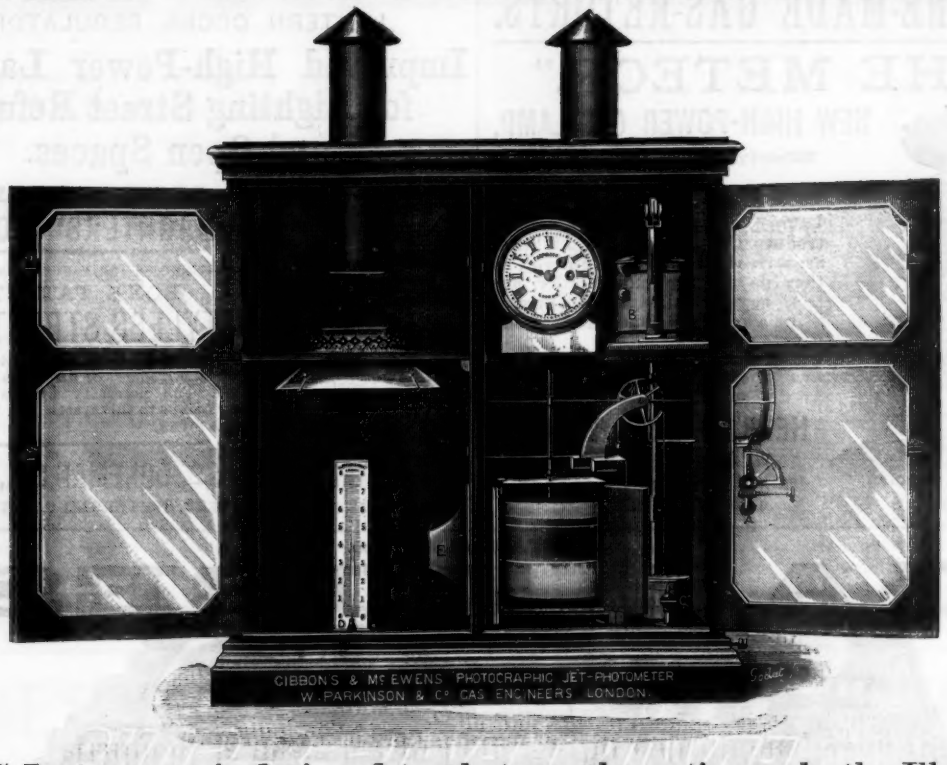
Special reference and attention are invited to our

WET AND DRY METERS,

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **ccuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **00 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

GIBBONS & McEWEN'S
PATENT
SELF-REGISTERING PHOTOGRAPHIC
JET PHOTOMETER.



THIS Instrument is designed to photograph continuously the Illuminating Power of Coal Gas, and have the same recorded upon sensitized paper, which records can be kept for future reference as to the actual Illuminating Power of the Gas sent out upon any date and time.

It is a very unique and handsome looking Apparatus, beautifully mounted, containing very sensitive Governor, with Brass Beam, Adjuster and Brass Pillar, Eight-Day Clock, and mechanism for turning Drum, King's Gauge with Bracket, Wheel, Adjustable Pointer and Scale, Camera Box of Polished Mahogany, with Guides and adjustable Illuminating Power Line, &c., Graduated Glasses, Ruby and Opal, with Gallery and Burner, Copper Chimneys for air currents, Opal Shade and all Fittings in Burnished Brass. The Micrometer Cock and Scale for King's Gauge are enclosed in a Box with Glass Front on side of Case, with Lock and Key.

FULL PARTICULARS AND PRICE ON APPLICATION TO

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Telegraphic Address: "INDEX LONDON."

[See also Advt., p. 958.

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